U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF ENTOMOLOGY.

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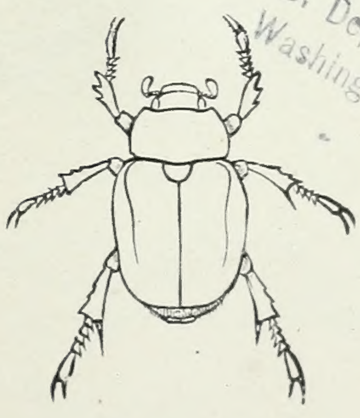
JULY, 1888, to JUNE, 1889.

INSECT LIFE.

DEVOTED TO THE ECONOMY AND LIFE-HABITS OF INSECTS, ESPECIALLY IN THEIR RELATIONS TO AGRICULTURE, AND EDITED BY THE ENTOMOLOGIST AND HIS ASSISTANTS.



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ERRATA.

Page 5, line 9 from top, and page 6, line 6 from top, read Sphærophoria for Sphœrophoria.

Page 8, line 7 from top, read annu*li* for annulæ.

Page 18, line 22 from bottom, read 1.1 inch — 27.5^{mm} for 1.1 inch 27.5^{mm}.

Page 20, line 24 from top, read O. simplex for O simplex.

Page 22, line 1 from bottom, read *all* for al.

Page 27, line 19 from top, read a*u*s for ans.

Page 38, line 10 from bottom, read Cycadace*æ* for Cycadacea.

Page 40, lines 7 and 8 from bottom, read "extends so far north as the Caloosahatchie River. As this region is entomologically still *terra incognita,* I can, etc."

Page 43, line 4 from bottom, read "were obtained" for "issued."

Page 44, line 1 from top and 3 from bottom, read *schizoceratis* for *schizoceri.*

Page 51, line 21 from top, read *eruditus* for *eruditua.*

Page 56, line 14 from top, read W. J. Holland for W. G. Hall.

Page 56, line 16 from top, read Holland for Hall.

Page 81, line 20 from bottom, read *pallidella* Chamb. for *pallidella Chamb.*

Page 82, line 11 from top, read resemble for resembles.

Page 82, line 13 from bottom, read "cilia with a" for "cilia a with."

Page 93 (facing) last line, read Insid*i*ous for Insid*u*ous.

Page 106, line 5 from top, read *poeyi* for *freyi.*

Page 110, line 10 from top, read m*e*thod for m*o*thod.

Page 116, line 7 from bottom, read *ἀροτρον* for *ᾰροτρον* and *οὐρα* for *οὐρά.*

Page 116, insert "*a*" above upper figure; and add to explanation of figure, "*c,* uncus."

Page 137, line 12 from bottom, add after "Philadelphia," (Vol. I, p. 310.)

Page 137, line 11 from bottom, read *Thrips* for *Thrip.*

Page 140, line 13 from bottom, read *Triphleps* for *Thriphleps.*

Page 141, line 24 from top, read *ochraceus* for *ochraceous.*

Page 141, line 21 from bottom, read *graminis* for *gramineæ.*

Page 146, line 6 from top, read *Hind-wings* for *Head-wings.*

Page 153, line 9, from bottom, read 1886 for 1866.

Page 155, line 11 from top, read *Hippobosca* for *Hipposboca.*

Page 162, line 4 from top, read sixteenth for fifteenth.

Page 162, bottom line, read *flavipes* for *flaripes.*

Page 172, line 8 from top, read Mr. *Gade* for Mr. Harrington.

Page 187, line 7 from top, add comma after curved.

Page 187, line 25 from bottom, read punctate for unctate.

Page 187, line 14 from bottom, omit "sub-opaque" after "Elytra."

Page 192, line 8 from top, read *fervens* for *ferens.*

Page 195, line 17 from top, read "Anaphorinæ" for "Anophorinæ."

Page 198, line 6 from bottom, read *Cossonus* for *Cossomus.*

Page 200, line 11 from top, read 1888 for 1886.

Page 201, line 4 from bottom, read ichthyologists for icthyologists.

Page 208, line 5 from top, read Aptères for Aptéres.

Page 214, line 3 from top, read *Third* New York Report for Fourth New York Report.

Page 220, line 9 from bottom, read Sinoxylon for Dinoderus; and *S. floridanum* for *D. floridanum.*

Page 224, line 4 from top, read "996" for "3,296 [*sic*!]."

Page 228, line 11 from top, read season for sea-son.

Page 228, line 4 from bottom, read *sieglinge* for *seiglinge.*

Page 233, line 8 from bottom, read Coleopterous for Coleoterous.

Page 233, line 6 from bottom, read *Carpophilus dimidiatus* for *Carpophilus mutilatus.*

Pages 245, 247, and 248 read Noël for Nöel wherever the name occurs.

Page 254, line 20 from bottom, read "cinereous speckled, with fuscous" instead of "cinerous speckled, with fuseous."

Page 261, lines 11 and 12 from bottom read "a separate heading" for "the head of General Notes."

Page 275, line 8 from bottom, read .025 ^{mm} for .02½ ^{mm}.

Page 278, line 7 from bottom, read Dugès for Dugés.

Page 285, line 7 from top, read *Tyroglyphus* for *Tryoglyphus.*

Page 292, line 5 from bottom, and page 293, line 2 from top, read Nietner for Neitner.

Page 295, transfer heading at top of page to after line 3.

Page 301, line 10 from bottom, read a*n*d for ad.

Page 301, line 9 from bottom, omit the figures "114–116."

Page 301, line 11 from top, read Trichoptera for Thrichoptera.

Page 302, line 13 from top, read 147 for 143.

Page 302, line 9 from top, read) for (.

Page 302, line 22 from top, read *Wiener* for *Weiner.*

Page 303, line 2 of explanation to Fig. 67, read "dorsa*l* view" for "dorsa lview."

Page 305, line 9 from bottom, read Staphylin*i*dæ for Staphylindæ.

Page 314, line 2 from bottom, and page 315, line 1 from top, read Kühn for Kuhn.

Page 315, line 3 from top, read *kühniella* for *kuhniella.*

Page 319, line 23 from bottom, read Harr. for Haw.

Page 322, line 21 from top, read Gräsern for Gra'sern.

Page 325, line 1 from bottom, omit comma after "Commissioners."

Page 345, line 9 from top, read *larreæ* for *larreœ.*

Page 355, line 10 from bottom, read *kühniella* for *kuhniella.*

Vol. I, No. I.] INSECT LIFE. [July, 1888.

SALUTATORY.

Ever since our connection with the Division of Entomology we have greatly felt the need of some speedy and regular means of publication in which might be printed short articles, notes, reports of the progress of investigations, and brief papers on entomological subjects which are either too limited in scope or too disconnected to be used in the annual reports or in the special bulletins of the Division. A vast amount of interesting matter, especially in correspondence, has hitherto been buried in the archives of the Division which has had no medium of direct communication with the public, especially that portion which includes the student of entomology and the actual workers in economic entomology. Some of these miscellaneous notes have been published occasionally under the heads of "Notes of the Year" and "Extracts from Correspondence" in several of the special bulletins of the Division (viz: Nos. 2, 4, and 12) and in the annual reports for 1879 and 1884. But there is much matter of general interest that is necessarily omitted from any such publications appearing only at irregular intervals. A periodical bulletin in which matter of timely interest can be given to the public without delay, and especially to the agricultural journals for still wider distribution, has become the more necessary now that active experiment stations have been established under the Hatch bill in most of the States.

It is not necessary to explain to the public the difficulties which have heretofore been thrown in the way of publishing from the Division such a periodical bulletin as is here proposed. We have in past annual reports intimated the great need of something of the sort and believe that Commissioner Colman has instituted no reform during his administration that will be productive of more general good or will give more general satisfaction, so far as the interests of economic entomology are concerned.

We hope to make the periodical interesting and useful to all in any way concerned in entomology, and, without further comments or prom-

ises, we cordially invite such to co-operate with us in our endeavors. With the aid of those associated with us in Government work, particularly of Messrs. L. O. Howard, E. A. Schwarz, and John B. Smith, we feel justified in expressing this hope and send to all, who may receive it, this first number, greeting.

During a large part of the year the force of the Division is actively engaged in experimental work and original research, which fact will preclude the issuing of this bulletin as regularly as an ordinary monthly; but it will be our endeavor to issue it on an average once a month, and to complete a volume with each year.

C. V. Riley,
Entomologist.

INSECT LIFE.

THE CORN-FEEDING SYRPHUS-FLY.

(*Mesograpta polita* Say.)

[Order DIPTERA; family SYRPHIDÆ.]

In his summary of the larval habits of the family Syrphidæ,* Dr. Williston makes the following general statement:

"The principal genera in which the larval habits are known are the following:

"*Baccha*, *Syrphus*, *Sphærophoria*, *Pipiza*, *Paragus*. Larvæ aphidophagous.

"*Mallota*, *Spilomyia*, *Xylota*, *Brachypalpus*, *Pocota*, *Myiolepta*, *Chrysotoxum*, etc. Larvæ in decaying wood or trees; some of them (*Mallota*) long, 'rat-tailed.'

"*Chilosia*. Larvæ living in stems of *Cardium*, *Sonchus*, *Scrophularia*, *Matricaria*, and in fungi (*Boletus edulis*, etc.).

"*Platychirus*, *Rhingia*, *Eristalis*, *Syritta*, *Orthoneura*. Larvæ in decaying vegetable matter, manure, or in soft mud impregnated with decaying vegetable matter.

"*Brachyopa*, *Xylota*, *Chrysochlamys*, *Ceria*. Larvæ found living in flowing sap of trees.

"*Crioprora*. Bred by Osten-Sacken, from larvæ found under oak bark.

"*Microdon*. Larvæ common in ants' nests. * * *

"*Volucella*. Larvæ are parasitic upon Humble Bees, living in their nests."

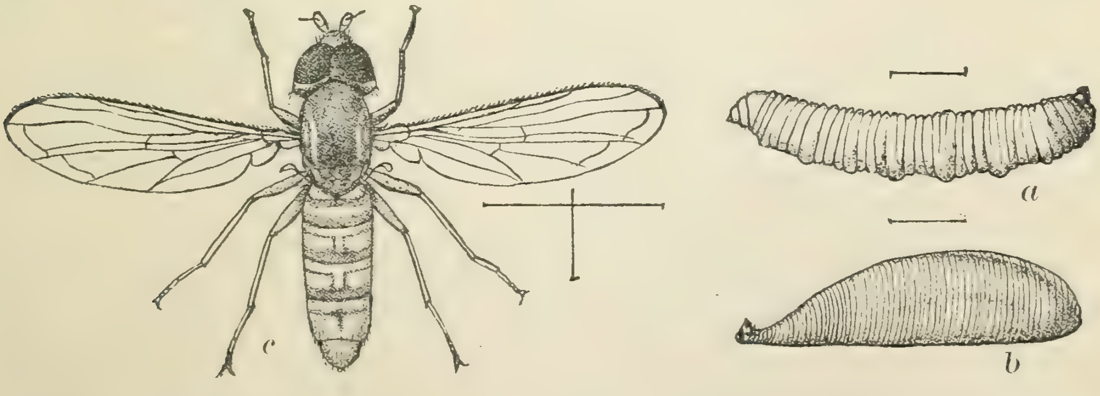

FIG. 1.—MESOGRAPTA POLITA. *a*, larva; *b*, pupa; c, adult—all enlarged (original.)

* Synopsis of the N. A. Syrphidæ (Bull. 31, U. S. National Museum), Washington, 1886, pp. 270-272.

It will be seen from this résumé of the known larval habits that the habits of the species which we are about to treat are quite abnormal in its family so far as known. Moreover, in its tribe, *Syrphini*, it is still more anomalous for the reason that the only two genera of this tribe of which the larval habits seem to be known, viz, *Syrphus* and *Sphœrophoria*, are carnivorous, feeding upon Plant-lice.

Mesograpta polita, then, as a plant-feeding species is worthy of record as of more or less abnormal habit, as well as on account of its possible effect upon the productive qualities of corn.

In August, 1885, Mr. E. C. Taggart, of Griggstown, Somerset County, N. J., sent to the Department some pieces of fodder corn taken from a field on his place, and which were covered with small yellowish maggots. His corn had not appeared to suffer from their presence and he was at a loss to know to what to attribute their presence. A microscopic examination of the living larvæ showed at once that the alimentary canal of each was full of partly-crushed pollen grains, and upon placing the fresh male blossoms of corn in the breeding jar the larvæ clustered upon them and were observed feeding upon the pollen grains.

Subsequent correspondence with Mr. Taggart showed that the maggots were noticed during that season for the first time, and when first observed (the third week in August) appeared to be confined to a single patch of fodder corn, occurring so abundantly as to cover the leaves and congregating most in the axils, where the upper leaves join the stalk. This patch of corn was cut August 22, and thirteen days later when it was partially cured, the worms were observed still living and increased somewhat in size. A patch of fodder corn, distant about one hundred rods from that on which they were first observed, was planted later, and did not blossom until the first week in September. The worms were then found to appear on this patch also, and again the "stalks became literally covered by them." Strange to say they occurred only in these two patches on Mr. Taggart's place; other fields examined by him were entirely free from the worms.

From specimens received from Mr. Taggart August 31 the adult flies were bred September 7 to 15, the larvæ having become coarctate a day or so after arrival. These flies were determined by Dr. Williston as Say's *Mesograpta polita*, a species which has a wide range throughout the United States east of the Mississippi, and which is also found in Cuba. It is about 8^{mm} long, and has a wing expansion of 14^{mm}, and is yellowish in color, marked with brown.

The damage which will be done by this insect in this way is not likely to be great. Should they increase enormously and spread to other varieties of cultivated corn they may reduce the yield considerably by preventing the fertilization of the female flowers and the "make" of the ears.

That this species is not confined to pollen for its larval food, but that it feeds also upon the leaves, and apparently exclusively upon the leaves in Florida, was discovered nearly a year later by one of our agents, Mr. Ashmead, who describes his observations as follows:

"On May the 30th many of the puparia were found attached to the upper surface of the leaves of corn and, near the base of the leaf stalk, in Col. L. W. Spratt's garden near Jacksonville. During that night and days subsequently, flies hatched out in my breeding boxes, and also some parasites.

"On June 1, after a thorough search, I found the larvæ in quantities, some feeding on the corn at the base of the corn-leaf stalk, others in soft discolored places in the stalk.

"Cutting into these discolored soft places then and days afterwards, with my knife, I discovered and obtained the larvæ, some fully grown, others not half grown, and watched them feed. They would elongate the front segments as is usual with Syrphid larvæ feeding on Plant-lice, protrude and puncture the saccharine cells of the corn, and suck up the exuding juice; the operation could be plainly seen through the translucent body walls of the larvæ.

"Parts of the stalk with these larvæ were taken home and placed in tin cans, to keep the stalk moist and prevent it from drying up; as the maggots matured they came forth, attached themselves to the stalk or to the sides of the tin can, and transformed to puparia, from which flies were afterwards obtained.

"The whole transformation from egg to fly is completed within a comparatively short period of less than three weeks. The egg hatches in from three to four days; the larva matures in from eight to ten days, and the fly appears in from eight to thirteen days.

"*Its injuries.*—While the larvæ must undoubtedly affect maturing corn, yet the injury they do can not be great; no appreciable injury was observed, and unless they increase and become much more abundant than they are at present no serious damage may be apprehended from their attacks by the grower."

On the receipt of this information from Mr. Ashmead, we wrote him of the New Jersey observations and directed him to verify his observations most carefully, noticing particularly whether the larvæ did not feed upon the pollen instead of, or as well as, the leaf and stalk. On receipt of these instructions he states that he went carefully over every field of corn, examining the tassels for larvæ, but could not find a single individual feeding upon pollen. The flies were found upon the plants in abundance and were observed to feed upon the pollen.

Mr. Ashmead reared from the pupæ of this insect three distinct parasites, which will be described in a future number.

The descriptions of the Syrphus fly which immediately follow will sufficiently enable its recognition in all stages. The early stages have never before been described.

MESOGRAPTA POLITA, Say.

Egg.—The egg, according to Mr. Ashmead, is pure white, elongate-oval, with longitudinal and intersecting cross-lines or grooves, not apparent to the naked eye. It measures nearly 1^{mm} in length.

Larva.—Average length about 7^{mm}. Slender, subcylindrical, tapering anteriorly, its posterior end slightly flattened. The whole body is divided by apparently 36 annulæ, and its surface is closely granulated. Mandibles black. The last segment bears the two short, stout, polished, dark-yellow spiracular tubes, each with 3 spiracles at the tip. Color pale yellowish, or more or less of the color of the pollen, with 2 medio-dorsal, slender, somewhat wavy purple lines, which start conjointly on the first segment, diverging but slightly posteriorly, and terminating on the anterior portion of the penultimate segment, which latter is marked in addition with 4 somewhat reddish and squarish spots, arranged in transverse square.

Puparium.—Length 5^{mm} to 7^{mm}. Clavate subcylindrical, slightly curved, its anterior end thickest and rounded. The posterior end has a median carina and rather sharp lateral edges and more or less flattened ventral side. The last segment bears the two spiracular tubes with black spiracles, the upper one of which is smallest and round, whilst the two other larger ones, which are placed close above each other, are transversely oval.

Color greenish or brownish yellow, marked often with a more or less distinct dusky median, an interrupted subdorsal, and a lateral line. The median line is generally present only along the posterior carina.

Imago.—Average expanse 14^{mm}, average length 8^{mm}. Eyes brown. Face of male entirely yellow; of female, with a broad, somewhat dusky stripe above antennæ. Face of both sexes in a certain light beautifully pearlaceous. The upper posterior margin of the head yellow, with yellow hairs. Cheeks whitish, with silvery hairs. Antennæ more or less dark orange, with their upper edge in the female somewhat dusky; bristle black. Thorax dusky, often with a brownish tinge and grayish median line. Scutellum and halteres, bright yellow. Metathorax, black. Sternum, blackish, with pearlaceous reflections. Legs and a large lateral spot below wings yellow. Abdomen banded with yellow and black, and with a pair of large, somewhat oval yellow spots on segments 3 and 4. Wings clear, iridescent, without spots or other markings.

THE WILLOW-SHOOT SAW-FLY.

(*Phyllœcus integer* Norton.)

By C. V. Riley.

[Order HYMENOPTERA: Family UROCERIDÆ.]

NATURAL HISTORY.

For several years past this species has been known to damage the young shoots of the different species of Willow and occasionally also those of *Populus nigra*, or Italian Poplar, on the Agricultural Grounds at Washington, but as the damage done was of no serious consequence it attracted only casual attention. Lately, however, its ravages have become of a serious nature with those engaged in the cultivation of willows for market purposes, and particularly on the plantation of Admiral Ammen, at Ammendale Md.; but the author of the mishief escaped notice and its work was attributed to *Cimbex americana* till in June, 1886, steps were taken to investigate the habits of *Cimbex americana*

and if possible to detect the real author. Till then the mischief had been attributed to this species,* but, notwithstanding that the field was literally swarming with this large saw-fly, not one was seen to puncture any of the willows. All the willows except very few along the edge of the field, which appeared to have been very recently injured, appeared to be in healthy condition. The affected shoots, the tips of which were hanging down, had become brown and almost dry from the fierce heat of the day, and showed, when closely examined, unmistakable evidence of the work of this *Phyllœcus*, whose life-habits, with the assistance of Mr. Pergande, we have been able to trace.

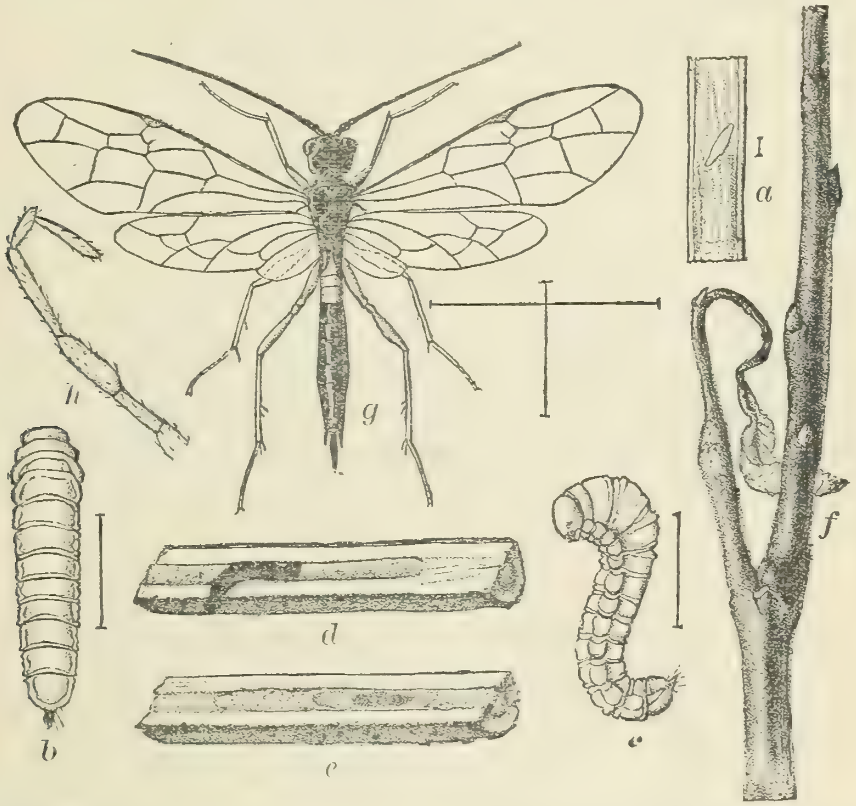

FIG. 2.—PHYLLŒCUS INTEGER. *a*, egg; *b*, larva, dorsal view; *c*, same, side view; *d*, *e*, two views of burrow; *f*, twig, showing damage; *g*, adult; all enlarged except *f*; *h*, antenna, still more enlarged (original).

Admiral Ammen stated that the year before almost the whole field looked like these shoots, appearing as if it had suffered from a severe frost or as if a fire had run over it, and that by autumn large numbers of the shoots had been killed close to the ground.

As the larva of this insect, which resembles very much that of *Urocerus* or *Tremex*, is a true borer, the female inserts her eggs in the stems of willows or nearly related plants and by a wonderful instinct girdles the twig after she has consigned her egg, to prevent it from growing any further, and in order to protect the egg from being crushed. The eggs are inserted in an oblique direction into the pith of the stem, from 2 to 6 inches below the tip, and the girdle is made about 1 inch above it.

The puncturing of the tip is evidently done with the ovipositor, as the punctures can be traced into the pith. The tips soon become dry and

* See Report Entomologist, Ann. Rept. Dept. Agr., 1884, p. 334.

brown and gradually drop off, so that by the end of the year very few remain in position. How long the eggs remain unhatched has not yet been observed; it is probably not more than about a week. The earliest date observed of the appearance of the flies from shoots which had remained out-doors all winter was April 16, while others continued to issue until the early part of June. The young larvæ appear to grow very slowly, and gradually bore their way down through the pith often to a distance of often more than 2 feet, completely filling the channel behind them as they progress with their frass. At the commencement of November most of the lavæ are full grown, and proceed to fill closely with frass the lower end of the burrow for about one-quarter or one-half inch. They then eat a passage through the side of the shoot and about one-quarter inch above the prospective cocoon, without, however, cutting through the bark. After this the delicate, transparent, cylindrical cocoon is spun, in which the larva remains through the whole winter. About the 1st of March it changes to pupa, in which state it remains for about a month and a half.

This is so far the only species among the *Cephides* found in America of which the history is known, although in Europe several species belonging to different genera have been found to infest stems, branches, or leaf-buds of different plants, and one species (*Cephus pygmæus*) is quite injurious to growing wheat, boring in the stalks in a similar manner.

REMEDIES.

A very simple remedy consists in pruning the tips of the shoots as soon as they commence to wilt. The tips should be cut off about 2 or 3 inches below the point where the punctures girdle the stem. The severed tips may be allowed to remain on the ground, as the eggs or larvæ will not develop in them, and whatever parasites the species may have will then probably mature.

DESCRIPTIVE.

Phyllœcus integer, Norton.

There are some differences between the specimens reared here and Norton's description of *integer*, but we feel disinclined to give them specific weight. According to Cresson's catalogue this species is placed in the genus *Cephus*, but from the few characters given in his synopsis we are not able to place it in this genus, and it is excluded from the only alternate, *Janus*, by characters given by Norton. We are therefore obliged to retain it in *Phyllœcus*.

Egg.—Length almost 1^{mm}, white, polished, elongate, oval, and slightly curved. Stouter at one end and more pointed at the other.

Larva.—Average length when full grown about 10^{mm}. Diameter almost 3^{mm}. Color yellowish. Head polished, indistinctly reticulated, with four shallow foveæ on the clypeus and a deeper one each side. Labrum large, conical, its tip rounded. Antennæ 6-jointed, extremely small, the 3 basal joints much the stoutest; rather close to the very small eyes. Mandibles large, broad, with 3 brown teeth. Thorax much swollen, especially its two posterior segments. Legs rudimentary, having a stout

conical basal piece, and a minute cylindrical, nipple-like apex. Cremaster brown, somewhat flattened, its base conical, yellow, and beset with brown teeth; its tip obliquely truncate, with a central puncture. The surface of the abdomen is covered with very minute sharp points, and its lateral margin is prominent, broad, and flat, and resembles on each segment a flat scale. The position of the larva in its burrow is in the shape of an S.

COCOON.—Length 10-13mm. Colorless and transparent. Cylindrical, rounded at both ends, filling completely the diameter of the channel, and situated near its base.

IMAGO.—*Male, female.*—General color black and highly polished. Head large, with sparse and very fine punctures on vertex. Clypeus sparsely pilose. Eyes brown. Mandibles white, with the three teeth, of which the median one is much the smallest, brown. Palpi pale yellowish, the two last joints somewhat brownish. Prothorax highly polished, rarely with any punctures, its posterior margin, tegulæ, base of wings, a spot each side on mesothorax, posterior to base of wings, tip of scutellum, and a small median spot on the metathorax yellowish white. Mesothorax closely punctured; punctures on scutellum somewhat coarser and not so dense; its disk and lower portion of the sides often without punctures. Sternum profusely punctured and covered with short grayish hair. Legs rufous, base of anterior and median coxæ and last joint of their tarsi, apical two-thirds of posterior tibiæ and their tarsi black. Base of posterior tibiæ yellowish. Claws bifid, reddish, with black tips.

Abdomen black, with either one, two, or three of the basal segments rufous in the female; the abdomen of the male is entirely black dorsally; ventrally, however, segments 1 to 4 are more or less reddish. Wings perfectly clear, iridescent, and without any spots. Stigma and veins black. Costa yellowish-brown, darkest near stigma. The basal transverse nerve of the first marginal cell is always abbreviated near the stigma.

THE SUGAR-CANE BEETLE INJURING CORN.

(*Ligyrus rugiceps* Lec.)

By L. O. HOWARD.

This insect has been known as a sugar-cane pest in Louisiana for many years, gnawing into the stubble in early spring and feeding from the middle of March until May and June. The writer's observations upon this habit of the beetle, made in Louisiana during the spring of 1881, were published in the Annual Report of the Department for 1880, pages 236–240 and in Special Report No. 35. In 1880 much loss was occasioned by its work on the rich sugar plantations along the Bayou Teche. During this year Professor Riley received specimens from Daniel Thompson, of Pattersonville, Saint Mary's Parish, and published a short account in the American Entomologist for May of that year (Vol. III, p. 130.) He had previously received specimens from a correspondent at Baton Rouge, who reported the beetle as injurious to young corn and grasses.

In June, 1885, Professor Riley received specimens of this insect from Mr. H. M. Houston, of Monroe, Union County, N. C., who stated that it was new to himself and neighbors, and that it worked just under the surface of the ground, cutting into young corn with five or six leaves, working in as far as the heart, and killing the center blades without

killing the side blades or without cutting the plant down. He gave no particulars as to the amount of damage. (This instance is recorded in Bulletin No. 12, Division of Entomology, p. 33).

In May, 1886, the same insect was received from a new locality. Mr. G. W. Smith-Vaniz, of Canton, Miss., writing to the Division under date of May 27, says: "I herewith mail you specimens of a bug that is very destructive to growing corn, especially in wet land. The section of corn plant sent with bug within it, where he was at work when taken, shows how complete is the work of destruction. I first noticed this pest last season (1885), though of course it may have been here before. There is general complaint of damage from it this year. It continues its ravages through the growing season, causing stalks to fall even when in ear." June 27 he again wrote: "I have delayed writing, awaiting further developments. The gravid females are at this time very numerous. I find a few eggs here and there singly through the earth, near to roots of the corn where the beetles are at work. These eggs are similar to those within the beetle. They hatch out a white grub with a horny, red head. I have not yet succeeded in getting any eggs from beetles in confinement, neither as yet have any eggs dissected from the beetles hatched. There is no abatement of the work of destruction, successive plantings only furnishing a fresh supply of favorite food to the insect. This is the worst insect enemy to the corn plant we have yet had on heavy, wet land. * * * We have had an excessively wet June, $8\frac{3}{4}$ inches of rain-fall to the present time during the present month, and still raining every day. I cannot say whether this is favorable or unfavorable to the beetle."

July 9 he sent a shipment of eggs and larvæ, though most of the former were destroyed by mold. He stated that a few days of hot sunshine, though with occasional showers, had made it hard to find the beetles. In a quite extensive search he found only one beetle, and that was a dead one. There was evidence, however, that the beetles had been at work the previous night. July 19 he wrote that although up to July 9 he had had little difficulty in finding eggs, young larvæ, and perfect beetles, yet after a week of dry weather they had entirely disappeared, and he could only find an occasional large white grub (larva of *Lachnosterna fusca*). He still, however, continued to find fresh work of the beetle, evidently done at night, and judged that they sought shelter from the sun elsewhere during the day. Once or twice, however, he took a lantern into the field at night, but the beetle was not attracted, and moreover it never found its way to the lights in the neighboring houses.

Mr. Smith-Vaniz also sent us at various times the allied beetles, *Ligyrus ruginasus* Lec., and *Anomala flavipennis* Burm., found among the Corn-beetles, but not identified in any way with their work.

Although the greatest care was taken with the eggs and young larvæ received in July, we were able to do nothing with them, and they died before fall.

During 1887 we heard nothing of this insect, possibly also from the fact that the larvæ may require two years for development. During the winter, in response to inquiries concerning the facts for 1887, Mr. Smith-Vaniz wrote that he failed to rear to maturity any larvæ in 1886; that they perished when apparently half-grown. He intended to pursue the subject in 1887, but, though there were a few beetles to be found early in the season, they disappeared so unexpectedly soon that he secured none for propagation. In 1886 they were to be found around the corn-roots throughout the growing season, and mature beetles were found as late as December 1.

Thus this subject, in spite of its interest and importance, remains comparatively unsettled, because the important point as to where and how the insect hibernates is still unknown. This article will set forth the rather curious fact of the great damage which may be done to corn by this species, and presents strong additional proof on the hitherto unsettled point of the place where the eggs are deposited. There can be no reasonable doubt that the eggs and young larvæ collected at the roots by Mr. Smith–Vaniz belong to this species; but the length of larval life and the manner of hibernation must be left to another favorable opportunity to decide.

It will be observed that the testimony above quoted, on the attraction of light to the beetle, is diametrically opposed to the statements by Professor Comstock on page 239 of his report for 1879, in discussing the injuries of this species to sugar-cane, and, if true, invalidates his consequent recommendation of the use of trap lanterns in the field. The writer, however, was informed at Franklin, La., in March, 1881, that the beetles were attracted in such numbers to the light in the windows of a small grocery as to be the subject of general comment. It is to be doubted, however, whether the beetles can be attracted by light when actually engaged in feeding, or until after oviposition has taken place.

EXTRACTS FROM CORRESPONDENCE.

[In preparing these extracts from correspondence, which we hope to make a prominent feature of this publication, we do not pretend to give the answer of the Entomologist in full and verbatim, but simply a digest of the important points.]

THE GARDEN WEB-WORM (*Eurycreon rantalis*) RE-APPEARS.

The Web-worm (*Eurycreon rantalis*) has made its appearance in this section again; the moths first appeared in great numbers some three weeks ago and are present now in great numbers; the caterpillars are feeding on the pigweed, sweet-potatoes, cabbage; I have not noticed them on the corn yet. Has there been any insecticide tried that has been successful? I will try pyrethrum, sulphur, etc., to-morrow on my cabbage.—[Jacob Nixon, Kellogg, Cowley County, Kans., June 14, 1888.

REPLY.—Yours of the 14th with information as to damage by the Garden Web-worm just received. I have had no occasion to publish anything concerning this insect since the publication of the annual report for 1885, a copy of which was sent

you at the time. You will remember that in that report I concluded that the only remedy likely to give satisfaction was spraying with either London purple or Paris green. I would advise you to give either of these poisons a thorough trial, and anticipate success.—[June 18, 1888.]

AN ENEMY TO THE DATE PALM IN FLORIDA.

I inclose two bulbs of date palms that show the work of some small animal or insect that eats the bulbs and destroys the plants. We have a large nursery of date palms and they are being destroyed by the hundreds. The animal makes a hole about the size of your little finger, but persistent digging did not find him. Do you know what it is?—[C. A. Bowdman, San Carlos Hotel, Saint James, Florida, February 3, 1888.

REPLY.— * * * The holes of which you complain have probably been made by the Palmetto Weevil (*Rhynchophorus cruentatus*). This is the largest of our native species of snout-beetles, and is very common in all of the Southern States in which the palmetto grows wild. The beetle is sometimes nearly an inch in length, and its usual color is a dull black, but frequently specimens are found which are bright red or red with black spots. Although usually confined to the palmetto the beetles attack all kinds of small palms. There is no remedy known except catching the beetles and killing them. They can be caught in large numbers by cutting off a palmetto plant say 1 foot from the ground, when they will congregate in large numbers upon the stump and can be picked off from time to time. The grub or larva of this species is eaten as a delicacy in South America.—[February 7, 1888.]

A VIRGINIA SIMULIUM CALLED "CHOLERA GNAT."

Inclosed herewith please find specimens of the "Cholera Gnat," which I trust will reach you in good time and condition.

The Cholera Gnat is the local name for these insects, because they are supposed to produce or cause the chicken cholera. There is no doubt about their causing the death of thousands of chickens and turkeys in this section yearly. I moved to this place in January last and was told that it would be impossible to raise chickens or turkeys as the cholera would kill them all; notwithstanding which I bought both chickens and turkeys, determined to fight the cholera should it appear. Saw nothing of it until about the 1st of April, when my attention was attracted first by the turkeys shaking and rubbing their heads, and upon examination found the gnats upon the wattles sucking vigorously. The gobblers and roosters are the first to succumb, as their wattles and comb are larger, exposing a larger surface for the gnats to work upon. The fowl grows weak and feverish; the discharge from the bowels becomes frequent and watery, resembling sulphur and water, and in a few days the fowl dies of "chicken cholera."

I send you this specimen of these gnats hoping you can give me some information regarding them, and can suggest a remedy. If I can free my chickens from these gnats I am satisfied there would be no cholera.—[James T. Gilliam, Mossingford, Charlotte County, Va., April 12, 1888.

REPLY. * * * The insect in question, and which you call the "Cholera Gnat," seems to be identical with the insect which is known in the Mississippi Valley as the Turkey Gnat, and which I described scientifically for the first time in my report for 1886 as *Simulium meridionale*. It is closely allied to the celebrated Buffalo Gnat of the Southwest and the equally well-known Black Fly of the North Woods. I will send you with this a copy of the report in which this species is described, which contains a summary of what is known about these insects, and you will find, I fear, that on the whole it is rather unsatisfactory, especially as regards remedies. I should like to hear from you as to whether the gnats appear during the greater part of the summer or if they are confined to a particular season. If the latter is the case, what is the duration of this period? You will notice from the report that the early stages of these gnats are all passed in running water, and the illustrations will probably enable

you to recognize these early stages in swift-running streams in your neighborhood. If the period during which the flies appear should be short, and if you are able to keep the fowls in a dark house during this period, you will probably find it advantageous to do so. The best applications to be made are indicated in the report, and will probably prove to be fish oil or something similar. Persian insect powder puffed upon the fowls will kill all of the gnats which happen to be on it at the time, but will probably not act as a preventive. * * *.—[April 16, 1888.]

THE BLACK-POLLED TITMOUSE DESTROYING CANKER WORMS.

Paleacrita vernata, or Spring Canker-worm, seems to be troubling our orchards hereabouts for the first time. I notice the birds and chickens are destroying a host of them. If London purple does not kill both, all will be well. One little bird, the black-polled chickadee or titmouse (*Parus atricapillus*), is hungry for them.—[W. S. Newlon, Oswego, Kans., April 23, 1888.

KEROSENE EMULSION AND THE CABBAGE MAGGOT.

Your kerosene emulsion has done wonders on *Anthomyia brassicæ*. We have used it on our cabbage, that was badly infested with cabbage fly, and now, upon examination, they are entirely gone and the plants not hurt the least, but your formula is too strong; 9 gallons of water to 1 of kerosene has killed all the plants we put it on; after that we mixed it 12 gallons of water to 1 gallon of emulsion, and this has done no harm to the plants, but has destroyed all the worms.—[Zimmer Bros., Mobile, Ala.

AFTER EFFECT OF THE OVIPOSITION OF THE PERIODICAL CICADA.

* * * Five or six years ago the so-called 13-year locusts did great damage to our orchards. I send a cut from a twig which shows their work. The wounds are on the underside of every branch less than an inch in diameter. Trees in such plight can not give crisp and juicy fruit. The apples are small, wilted, and tough, and let go their hold on the tree with a slight breeze. My row of Rome Beauties fruited heavily the past two years. At harvesting time not more than a dozen remained on the trees. It was the same with other varieties.

As far as my observation extends other orchards are like mine geatly damaged by the locusts.

This is not a flattering statement, but I thought it right to give facts, and hope to be able to give a more favorable account in future.—[A. G. Alexander, Queen City, Mo., February 13, 1888.

[See fig. 3, plate V, Rept. Ent., Ann. Rept. Dept. Agr. 1885, for illustration of appearance of scars from puncture of Periodical Cicada after second year.]

MORE TESTIMONY ON THE BUCKWHEAT REMEDY FOR CUT-WORMS.

Have you ever noticed the effect of plowing under a crop of buckwheat to keep cut-worms off the land? It has been our experience the last fifteen years that wherever we turn under a crop of buckwheat we will not have any cut-worms on it; but this year has been the most remarkable of all. The seed we got from the North was of a very poor quality, hardly coming up at all. So we sowed the remaining seed, about two bushels, on a piece of about one-half acre. This gave us a good stand. Now everywhere cut-worms are plenty, except on the little piece where the buckwheat has been turned under. We always have been free from cut-worms on land we have plowed buckwheat under, while our neighbors have sometimes their whole crop ruined by them.—[Zimmer Bros., Mobile, Ala., February 6, 1888.

AN APPLICATION FOR BUFFALO GNAT BITES.

In looking over your report for 1886 I do not see a preventive for buffalo gnats that I used successfully during the war. In the absence of fish oil, which had been used previously, I used tallow, with sufficient pine tar to make it stick the hair together, but not enough to take the hair off, as I was told it would. Lost none of about 90 mules and horses.—[Jona Pearce, Gwiney's, Va.

COMPARATIVE MERITS OF THE ARSENICAL SOLUTIONS.

We are vitally interested in the best methods of fighting the Codling Moth. We expect a big crop of apples next year, and we are investigating the spraying with the arsenical solutions. I don't see why, from a chemical standpoint, the reason for using Paris green or London purple, as both are hard to make a perfect solution, and it must be the arsenic which does the good. Why not use the common white arsenic? It is easily dissolved, and with concentrated lye will make a perfect and stable solution, and is cheap. From all that I can learn from California and the East a weak solution, used frequently, is better than a strong solution, as the stronger solutions burn the foliage. I will try one-half pound arsenic, 1 pound concentrated lye, to 400 gallons water, and will spray the latter part of May, June, and July. * * *.—[A. Goslin, Oregon, Mo., December 26, 1887. Addressed to Prof. S. A. Forbes.

REPLY.—Your letter of the 26th of December, addressed to Prof. S. A. Forbes, has just been referred by him to this office for reply. White arsenic has been used against the Codling Moth by several experimentors, with a fair measure of success. J. N. Dixon, of Oscaloosa, Iowa, was the first to use it for this purpose, and he was enthusiastically in favor of it. In his essay on orchards and insects published in the Transactions of the Iowa State Horticultural Society for the year 1882, he advises a much stronger solution than the one which you propose to try. Less than 1 pound of arsenic to 150 gallons of water, he states, will burn the foliage, and he himself was accustomed to use 1 pound to 200 gallons of water. He first dissolved the arsenic by boiling in a smaller quantity of water, afterwards diluting to the required strength. The tests of later experimenters give the preference to London purple and Paris green, for the reason that they seem to take less effect upon the foliage than the arsenic alone. In other words, when the solution of white arsenic is strong enough to kill the insects in one or two applications it is very likely to burn the foliage. This is not an absolute statement, but a comparative one. Cook, of Michigan, prefers London purple; Forbes, of Illinois, and Wickson and Klee, of California, give the preference to Paris green. I myself am inclined to the opinion that London purple, on the grounds of effectiveness and cheapness, as well as from the fact that trees which have been treated can be readily distinguished by color, is perhaps the best substance which can be used; although its advantages over Paris green are slight. It should never be used in a solution stronger than 1 pound to 100 gallons, and it should be applied as soon as the blossoms fall.

If, however, you are still inclined to experiment with the arsenic and concentrated lye, I shall be very glad to learn your results, and such an experiment as you propose will certainly be instructive.—[February 16, 1888.]

PROBABLY A NEW ENEMY TO PEAR FROM OREGON.

Inclosed find affected pears and leaves, also an insect which I detected eating the foliage of my young pear trees. I saw none on the bearing trees, but as nearly all the fruit is affected on them (three trees left of an old orchard) the inference would be that they had left the fruit to attack the foliage on the young trees just set out. I have just set out an orchard of 150 acres, and want to head off all destructive insects. What is this insect and what the remedy?—[R. S. Wallace, Salem, Oregon, May 12, 1888.

REPLY.—I have read your letter of May 12, and examined the accompanying specimens with considerable interest, for the reason that this insect has never been known before to do such damage as you describe. It has no common name, but is a snout-beetle, known as *Aragnomus griseus*. May I inquire whether you are absolutely certain that this is the insect which did the damage, and whether you are sure that it injured the fruit? Nothing is known of its breeding habits, and the only thing that we can do is to recommend a remedy for the adult insect. To this end I would advise you to spray your young trees with a solution of Paris green or London purple in the proportion of 1 pound of the poison to 100 gallons of water * * * .—[May 22, 1888.

AN EXTRAORDINARY TWILIGHT FLIGHT OF LACHNOSTERNA.

* * * Inclosed please find specimens of bugs which passed over from north to south in wonderful swarms or droves the evening of the 7th, about one to every 18 inches square, as low as 5 feet from the ground to 12 to 15 feet high. When I first heard them I thought it was a swarm of bees, but soon saw my mistake. When I first heard and saw them the sun was just hid from sight, and they continued to fly until quite dark. As far as I have heard the swarm or drove was 1½ miles wide. Where they came from or whither they went I do not know, but it was new to me, both insect and their great number. I send them to you to know if they are common and their origin.—[S. H. Linton, Burrows, Ind., May 9, 1887.

REPLY. * * * The beetle proves to be *Lachnosterna tristis*, a near relative to the common May beetle, which, as you doubtless know, is the parent of the White Grub. This particular species is one of the smallest of the genus and is not at all uncommon. It is frequently turned up in plowing, as it hibernates in the beetle state under ground. The larva is much like the White Grub, through smaller, and probably feeds upon the roots of various plants in the soil. The swarming which you describe is very interesting. These beetles often occur in great numbers, but so far as I am aware they have not been observed to fly in such swarms before dark. They probably bred in the near neighborhood of the locality where they were observed, and as they feed on leaves of different trees soon after dark, they were probably in search of proper food.—[February 15, 1888.]

LIME AND TOBACCO FOR CURRANT WORM.

Results of experiments are requested by the very inception of your Department. I will relate a success. Last summer I went out into the garden one morning and found the currant worm (*Nematus ventricosus*) had attacked one side of a currant bush and one side of a gooseberry bush. I sprinkled the parts of both on which the worms were at work, and then dusted on a compound of 2 parts of unslacked lime and one part of tobacco dust, from a cigar factory, which killed every worm and stopped the injury. One application was sufficient.—[V. M. Firor, Charlestown, W. Va.

SOME NOTES FROM MISSISSIPPI.

I have the honor to submit a report on insects most injurious to field and garden crops for the past year, 1887.

(1) The Cottonworm (*Aletia xylina*) appeared in some portions of our county in July, in others in August, and in my own vicinity about the middle of September. The damage done by them averages from 10 to 40 per cent. of the entire crop. I have found one of the worms closely wrapped up in dead Sweet Gum leaves in the fence corners of my field as late as January the 8th, 1888, but in a very stupid condition. (2) Boll-worm (*Heliothis armigera*) did but very little damage here on corn as well as cotton. (3) White Ants or "Wood Lice" (*Termes flavipes* K.). Have found these insects destroying a good many cotton-stalks during the past summer, attacking the stalk just below the soil, eating out the interior, which would kill the plant at every instance. (4) Southern Cabbage-butterfly (*Pieris protodice* B.). The cabbage crop was seriously damaged by the worm of this fly. (5) Cabbage Plusia (*Plusia brassicae* R.). This worm likewise did a great deal of damage in the gardens of this community. (6) The Greasy Cut-worm (*Agrotis ypsilon*, Rott.). This worm has been more plentiful this past season and destroyed the stand of cabbage plants as fast as transplanted. (7) Glassy Cut-worm (*Hadena devastatrix* B.). Found several specimens of this variety in my garden cutting down cabbage, beet, and radish plants. (8) Squash Borer (*Ægeria cucurbitae* Harris). This insect has been a formidable enemy to squash, pumpkin, cashaw, and cucumber, killing them in many instances in field and garden.—[G. H. Kent, Roxie, Miss., January 28, 1888.

NEW SPECIES OF ONCOCNEMIS.

By John B. Smith.

In continuation of the work on the Monograph of the Noctuidæ by Professor Riley and myself, the following new species are found to occur in the genus *Oncocnemis:*

O. fasciatus, sp. nov.

Head, thorax, and primaries dull fuscous gray. Primaries with basal line single, distinct, black. Basal space to t. a. line paler, more ashen gray. T. a. line rather broad, single, black, outwardly oblique, making two large and not very prominent outward curves. T. p. line single, marked at costa, making a strong outward curve over reniform, then strongly incurved, interrupted by the white transverse band, again distinct below the reniform, and with a slight inward curve to inner margin. Claviform wanting. Orbicular rather small, round, narrowly outlined in black, somewhat paler than ground color. Reniform large, not very well defined, white, with a narrow fuscous crescent. Between reniform and t. p. line the ground color obtains and gives a deceptive appearance of the reniform in the broad white band. A narrow shade band crosses the outer part of the median space, distinct and blackish on costa, less marked below. A broad, white, transverse shade, over and including the reniform, leaving a fuscous patch beyond that spot, inwardly limited by the t. p. line, and almost extending to the s. t. line. S. t. line marked only by a series of sagittate black dashes, shading off into the white band. Terminal space of ground color. A narrow, terminal, dark line. Fringes concolorous, fuscous, narrowly cut with darker brown. A whitish line at base. Secondaries dull smoky brown at base, outwardly limited by a black transverse band. Beyond this a broad white central band, the outer margin again broadly black. Fringes white, basally fuscous. Beneath, both pairs of wings fuscous gray at base, outwardly limited by a black band; this is followed by a broad white band, the margins again broadly black. Head and thorax concolorous with basal space of primaries, abdomen a trifle paler.

Expands 1.1 inch 27.5^{mm}.

Habitat, Nevada County, California. (Sept.)

A single ♀ in the Coll. U. S. N. Mus. (from Dept. Agric., Koebele, collector).

The species is strongly marked and unlike any heretofore described. The common white transverse band is characteristic and renders the species easily recognizable. Its general appearance seems to refer it most nearly to the yellow underwinged group.

O. tenuifascia sp. nov.

Head, thorax, and primaries dull fuscous brown, the ordinary maculation of primaries distinct, though not prominent, blackish. Basal line present, black, with a narrow, following pale line. T. a. line distinct, oblique sinuate, black, preceded by an equally distinct pale line. Practically the line is geminate, the inner portion reduced to a few dark scales defining the intermediate pale shade. T. p. line distinct, geminate, inner line black, distinct, outer line punctiform, the intervening space white, the white line becoming broader toward the inner margin. As a whole, the line curves outwardly over the reniform, and nearly straight below vein 2. Claviform distinct, black margined, concolorous. Orbicular small, round, black ringed, with an inner white annulus. Between the ordinary spots the cell is blackish, and from this point the narrow median shade runs parallel with and close to T. p. line to the hind margin. Reniform rather small, narrow, normal in shape, not very distinctly outlined, first black margined, then with a paler annulus, the center of ground color of wing. S. t. line irregularly, but not strongly dentate, narrow, whitish, in-

terrupted, preceded by a series of small black spots. A few white scales in S. t. space opposite cell, and a rather large indefinite pale spot filling the space near hind margin, a row of black terminal lunules. Fringes dusky, cut with darker fuscous and with a fuscous line at base. Secondaries smoky at base, limited by a sinuate black band, then a narrow white band, followed by the broad, black outer margin. Fringes white. Beneath, both pairs of wings smoky at base, with a common black median band, followed by a broader white band, the outer margin broadly black.

Expands .88 inches—22^{mm}.

Habitat Colorado.

A single female in Mr. Tepper's collection. The species is an easily recognized one. Its small size and the banded secondaries are unusual. The primaries are somewhat broader and shorter than usual, and the body somewhat less robust. The eyes are not very distinctly lashed.

Despite its somewhat abnormal appearance I believe the species correctly referred here.

O. IRICOLOR sp. nov.

Head, thorax, and primaries somewhat pale luteous, the primaries more or less powdered with bluish-black atoms which have an iridescent metallic glitter. Basal line present, black, followed by a narrow pale line. T. a. line geminate, outer line black, inner line more or less punctiform, the included space pale. As a whole, the line is somewhat irregular, very slightly curved outwardly. At the inner margin the line is preceded by a large patch of metallic dark scales, which in one specimen crosses the entire wing and in the other is limited to the inferior third. Claviform small, pale, not defined. Orbicular rather small, round, a little irregular, pale ringed, center concolorous. Reniform moderate, upright, somewhat constricted medially, pale ringed. A somewhat fuscous median shade darkens the cell between the ordinary spots, and continues as a narrower dark shade, parallel with and close to the t. p. line. T. p. line narrow, black, crenulate, interrupted, widely curved over the cell, and then with a regular inward curve to the hind margin. The narrow black line is followed by a broader, more even pale line, from which point the s. t. space darkens and becomes metallic black to the irregular, pale, and somewhat interrupted s. t. line. A row of terminal, dusky lunules, inwardly margined by pale scales. Fringes unusually long and pure white. Secondaries faintly yellowish, glistening, with a broad, black border and a distinct discal lunule. Fringes also pure white. Beneath the wings are very pale whitish yellow, with broad, blackish outer margins, the discal spot of scondaries more distinct. Head with a few reddish scales between the antennæ. Abdomen like wings beneath. Expands 1.25 inches $=31$–32^{mm}.

Habitat, Colorado.

Three specimens, all females, 1 Coll. U. S. National Museum (Smith Coll.), the others Coll. F. Tepper.

This is perhaps the most beautiful species of the genus, the metallic dark scales and the very long white fringes offering distinctive characters. The specimens differ considerably in the amount of metallic irroration; one so covered as to darken the entire specimen, another specimen with the dark markings only metallic. The species is most nearly allied to *augustus*, Harvey.

O. TERMINALIS sp. nov.

Head, thorax, and primaries dull fusco-luteous, primaries with a broad, blackish terminal shade. Basal line of primaries faintly indicated by a few black scales. T. a. line geminate, marked on costa by distinct black spots, then becoming very faint, traceable principally by the paler inclosed space, and again becoming distinct below

the internal vein, feebly dentate in its course, a blackish blotch preceding the line on internal margin. Orbicular small, round, pale ringed, center concolorous. Reniform moderate in size, normal in shape, pale ringed, with a dusky lunule inwardly, else concolorous. Between these spots the median shade is marked by a black costal spot, thence continued as a narrow sinuate, faint dusky line to the hind margin. T. p. line geminate, distinctly marked on costa, thence interrupted, punctiform, marked by black or brown venular dots, outwardly curved over cell. S. t. line narrow, pale, interrupted, irregularly dentate. From the internal margin beyond the t. p. line an oblique, blackish terminal shade extends to the apex, somewhat narrowing above the middle. Through this dark shade the s. t. line is picked out by pale scales. A row of black terminal lunules, preceded by pale defining scales. Fringes very long, with a central darker line, beyond which they are cut with blackish. Secondaries glistening white, somewhat smoky basally, and with a very broad, black outer margin. Fringes white. Beneath wings whitish, with a broad, black terminal margin. Primaries with a whitish terminal line. Fringes white, on primaries narrowly cut with brown, becoming black at tip. Head with a brown frontal line and a brown interantennal tuft. Collar black tipped, and behind it the thorax is powdered with black scales; abdomen very pale luteous.

Expands 1.25 inches—31^{mm}.

Habitat, Colorado.

A single female in Mr. Tepper's collection. A very distinct species. The collar is evidently produced medially, and there is a distinct basal tuft. The dark terminal space is characteristic.

O SIMPLEX, sp. nov.

Head, thorax, and primaries powdery fuscous, the maculation distinct. Basal line distinctly traceable, geminate. T. a. line upright or slightly incurved, strongly dentate, geminate, the outer line black, the inner line fuscous brown, included space somewhat paler. A narrow black line from base to t. a. line. T. p. line faintly geminate, inner line only distinct, black, slightly lunate, exserted over reniform, and somewhat incurved below. Claviform very long, almost crossing median space, black margined, with a pale inner line and a concolorous center. Orbicular longitudinally oval, paler ringed, concolorous. Reniform moderate in size, pale ringed, with narrow black margin, the center somewhat paler. A faintly marked shade between the ordinary spots, less marked below median vein. S. t. line pale, interrupted, irregularly sinuate and dentate, preceded by a series of long sagittate interspaceal black dashes. A row of black terminal lunules. S. t. space pale at t. p. line, rapidly darkening to the s. t. line. The veins are paler through the darker parts of the wing, and black marked beyond. Secondaries white, semi-transparent, with distinct black outer border. Fringes white. Beneath whitish, with smoky-black outer border. Head with an interantennal blackish line followed by a pale line. Collar with a black line inferiorly, black tipped, and a whitish line below the black tip. Thorax also sprinkled with black scales.

Expands 1.46 inches—36^{mm}.

Habitat, Ashley Valley, Utah.

A single, somewhat rubbed specimen, without fringes to primaries, in Mr. Edwards' collection.

This species is closely allied to *levis*, and intermediate between that and *augustus*. From the former it differs at once by the longitudinally ovate orbicular. The ground color is not ochreous, and there are numerous minor differences. The chief and very strongly marked difference between the two is in the structure of the male genitalia, differences which need not be pointed out here at present.

AN AUSTRALIAN PARASITE OF ICERYA PURCHASI.

By S. W. WILLISTON.

[The following descriptions of a new genus and a new species of Oscinidæ were drawn up at our request by Dr. Williston from specimens received from Frazer S. Crawford, of Adelaide, South Australia, who reared them from adult females of *Icerya purchasi* Maskell and from *Monophlœbus crawfordi* Maskell in that colony. The species has been artificially introduced into California and we shall soon have occasion to write about it at greater length.]

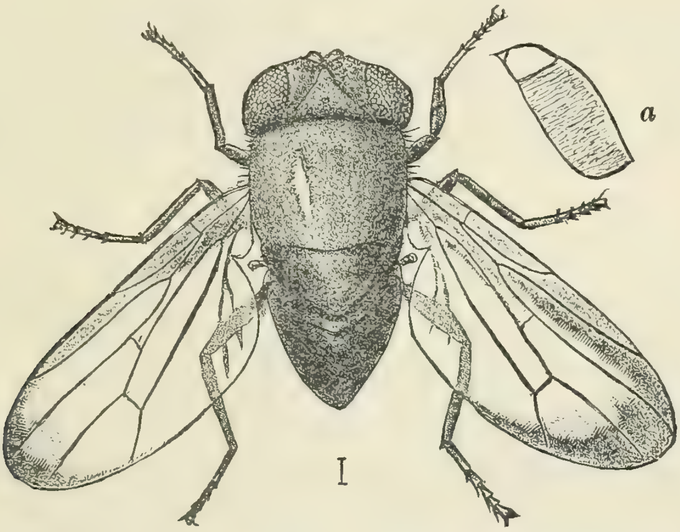

FIG. 3. LESTOPHONUS ICERYÆ. *a*, antenna enlarged (original.)

LESTOPHONUS,* gen. nov.

Front broad, plane, with scarcely distinguishable hairs in upper part. Antennæ large, the first two joints short, the third two or three times as long as broad, reaching quite to the oral margin; arista wanting. Face flattened or gently concave; thorax without bristles; scutellum large, about half as long as the thorax, convex. Abdomen short ovate, rather broad, composed of five segments, thinly and briefly hairy. Legs rather short and strong; middle tibiæ with a minute or indistinct spur at the top; all the tibiæ without erect bristles on the outer side before the tip. Wings short and broad; auxiliary vein wholly wanting; first longitudinal vein terminating at the basal third, the costal vein at the tip of the third longitudinal vein; second and third longitudinal veins nearly parallel, the fourth vein gently divergent; penultimate section of the fourth vein a litle shorter than the ultimate section of the fifth; second basal cell and the discal cell united; anal cell distinct, but small.

Notwithstanding the presence of the anal cell the present species must, I believe, be located with the *Oscininæ*. The absence of distinct bristles on the front, or, indeed, elsewhere on the body, will prevent its location with the *Drosophilinæ*. In all the four specimens that I have examined the arista seems entirely wanting; I can not attribute its absence to injury. This remarkable character, together with the absence of the anterior basal cross-vein, and auxiliary vein, and the very large third antennal joint will, I believe, render the genus easily recognizable. I can find the description of no genus that will apply, and I have but little or no hesitancy in describing it as new. *Mosillus*, from Europe and Africa, seems to be its nearest relative.

LESTOPHONUS ICERYÆ, sp. nov.

♀, Length 1.1^{mm}. Face, front, dorsum of thorax, and scutellum deep blue, moderately shining. Antennæ black, oblong, with rounded end. Abdomen punctulate,

* Ληστης—a plunderer. Φονευς—a killer.

deep shining green, in some specimens more or less blue. Legs dark brown, or blackish brown; front tarsi more lutescent or brownish yellow. Wings grayish hyaline. the veins dark brown.

Three specimens, from Professor Riley.

THE PRIVET WEB-WORM.

(*Margarodes quadristigmalis* Gn.)

[Order LEPIDOPTERA: Family PYRALIDÆ.]

THE PRIVET.

The Privet (*Ligustrum vulgare* L.) is a very common hedge plant in Europe, of general distribution and native in Central and Southern Europe. It and the closely allied Japanese species (*Ligustrum japonicum*) were introduced into this country in the beginning of the present century, and both have become thoroughly naturalized in some of the older States. Practically the sole use of the Privet in America is as a hedge-plant, for which purpose it is preferred in many localities to the ubiquitous Osage Orange (*Maclura aurantiaca*), chiefly on account of the absence of spines and also because it thrives well in much more northern climates. In Europe, however, its close-grained, hard wood is used for turning and shoe pegs, its twigs for tanning and as a substitute for osier, and its berries for red, black, or blue colors in certain dying processes, while formerly its astringent leaves were used in medicine. A well cultivated and carefully trimmed privet hedge, with its bright green foliage, is a most beautiful sight; if inclosing an orchard, and not kept too low, it forms an excellent shelter for many insectivorous birds, which love to build their nests in such protecting places. Grown singly or in small groups it attains quite a large size, and bears bunches of dark purple berries.

It suffers in America from a sudden blight, probably the result of the attack of the fungus *Phyllosticta ligustri* Saccardo, and certain leaf-eating caterpillars occasionally feed upon its foliage. But the plant has always been considered almost insect proof in this country, although in Europe twenty or more insects feed upon its leaves, the great majority of which are lepidopterous, including one of the finest of the European Hawk Moths, the *Sphinx ligustri*.

The following statements have been prepared from notes made principally by Mr. Howard and Mr. O. Lugger:

APPEARANCE OF THE WEB-WORM.

The new web-worm was first noticed upon the plants in some extensive hedges grown in the gardens connected with the Department of Agriculture at Washington, June 20, 1886, and later it was found in other parts of the city. None of the gardeners had ever seen it before, and naturally were somewhat anxious about the matter. The hedges affected by these worms, presented a most miserable sight, almost al

the leaves of the upper half of the young shoots, from two to six inches in length, were destroyed, and only fragments of leaves or portions of their midribs had been left untouched here and there. The caterpillars, which had done all this mischief, were found hidden in delicate, white, silken webs, either between the upper leaves when still quite small, or lower down on the older leaves when about fully grown. These webs, in which the caterpillars hide themselves, become in course of time partly filled with their black excrement, looking like gun-powder, and add still more to the disfiguration of the plants. The caterpillars, when disturbed, show great activity, and wriggle excitedly out of their webs; in falling they suspend themselves by a long, silken thread. If the disturbance ceases, they gradually work their way back to their homes.

Collectors of Lepidoptera had seen this moth but twice before in Washington. One specimen had been captured many years ago; it was found flying around the gas-light. The second specimen was found, in 1882, on the Virginia side of the Potomac.

NUMBER OF BROODS.

The greatest damage was done by the first brood, or at least the effects of the injury were more apparent. The second brood, living upon the same shoots, already so much disfigured, were hardly perceived, since they added but very little to the general effect. No caterpillars were observed out doors during the month of August; they were to some extent kept in check by parasites. The electric light has also been of immense value in destroying this pest. Thousands of the moths were attracted to it and never found their way back to the plants to deposit their eggs for other broods. But in captivity the result was very different, and indicated beyond any doubt the possibility of a very great danger to these privet hedges, if the insect should once have full sway to breed unmolested. Not less than four broods of moths were raised in the course of the summer, the last brood laying eggs, which, perhaps, not being fertilized, did not hatch. Moths of the different broods appeared July 2, August 5, September 6, and October 11.

LIFE HISTORY.

The Egg.—The scale-like eggs are very soft, light-green, sculptured, and measure 0.6^{mm} in length and 0.4 in width. They are usually fastened to the leaf near its mid-rib, either upon the upper or the lower surface. Being so very small, and of a similar color to that of the leaf, they are very difficult to detect. And this is still more the case in breeding-cages, where the restless moths scatter their very loosely attached, silvery-white scales so profusely over the somewhat adhesive surface of the leaf, that it soon becomes densely covered with them, thus adding to the difficulty of finding the eggs. From three males and two females imprisoned 65 eggs were obtained, yet no doubt more had been deposited but not found. These eggs in the course of a few days darkened somewhat and plainly showed the embryo. They hatched on the fifth day after being deposited.

The Larva.—In color the caterpillar of this Pyralid varies greatly, but it is usually of a lighter or darker green; the darkest specimens are almost bluish-green, the palest yellowish-green. In the great majority of cases the piliferous warts are black and polished, but in others, and chiefly in the smaller ones, they are of the same color as the body. In fact, hardly any two caterpillars, coming from the same moth, are exactly alike. The arrangement of these warts is best observed in the darker specimens, where two rows of them, each consisting of two warts, form an almost exact square upon each abdominal segment. The warts below and above the spiracles are longitudinally oval and rather far removed from the dorsal rows. The cervical plate is either black with greenish or green with blackish markings. The yellowish-green head is distinguished by two ill-defined, oblique and dusky stripes, which diverge posteriorly. The very small spiracles are dull yellow. In a number of very dark green specimens the head is more yellow than green and not marked with any black. Quite a number of these caterpillars are almost olive-green, suffused more or less with cherry-red. The recently hatched caterpillars are white, with a pale yellow head. These highly polished caterpillars reach a length of 20mm when they cease to feed and prepare to pupate. The duration of their larval existence is about three weeks.

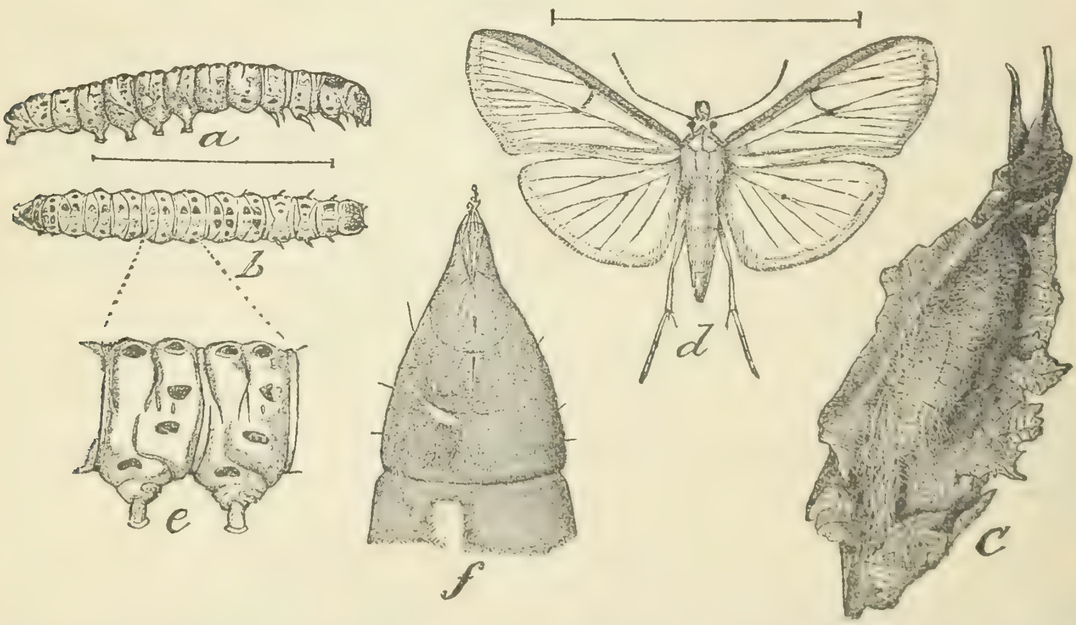

FIG. 4. MARGARODES QUADRISTIGMALIS. *a*, larva, side view; *b*, same, dorsal view; *c*, cocoon; *d*, moth—all slightly enlarged; *e*, two segments of larva from side showing arrangement of spots; *f*, anal segment of pupa from below—still more enlarged (original).

Pupa and Cocoon.—The slender, bright amber-colored pupa is 15mm long, and is well protected by a double cocoon, which is, however, so thin and transparent that the pupa can clearly be discerned inside of it. The white and delicate outer cocoon, usually fastened securely between leaves or to the rubbish under the hedge, is somewhat oval, though frequently very irregular in shape; it is frequently a little denser near the anterior end. The inner and still thinner cocoon surrounds the pupa quite closely, and is connected with the outer one by a number of irregular threads. As the moth matures inside the pupa the former bright

color gives place to a dark brown, and soon after, or in about eight days after commencing to spin the cocoon, the winged insect appears.

The Moth.—The species of Margarodes are quite numerous, and all are confined to warmer regions. From a list of specimens in the collection of the British Museum, published in 1859, it is seen that 39 species had been described up to that year. One species is found in Southern Europe, one in North America, three in the West Indies, ten in South America, seven in Africa, eleven in Southern Asia, five in Australia, and one in the Sandwich Islands. The European species is very similar to the one under consideration, and has been confounded with it by Duponchel. *Margarodes quadristigmalis* Gn., described vaguely as occurring in North America, is found also in the island of St. Domingo.

All the species of this genus are characterized by white or greenish hyaline wings with more or less opaque margins. The males possess a hidden tuft of long hairs at the tip of the abdomen, which they can spread out like a fan if excited.

The expanded wings of the Privet Moth measure 30^{mm} and its body is 12^{mm} long. The general color of the moth is iridescent white, with very transparent wings, that possess opaque white veins. The anterior borders of the upper wings are light brown, and this color extends over the margin of the thorax, forming thus a continuous brown edge. Three darker brown, almost black, spots are situated just below it, and join the posterior edge of this brown border; the fourth discal spot is of the same brown color. The outside edge of the upper wings shows a very narrow brown line, ornamented towards its summit by four or five small brown dots. The outer edges, the fringes of hairs, and the posterior edges of the wings are opaque white. The white, hyaline color, a very narrow brown line with two dots near its summit on the outer edge, an opaque white fringe of hairs, a small, discal, dark brown spot, and a faint line of the same color above it, which is sometimes connected with this spot, distinguish the lower wings. The head is white, with brown eyes and trophi. The thorax, excepting its brown anterior edge, is covered with very large white and iridescent scales, which are loosely attached. The abdomen is also white, with a distinct greenish tinge; the last abdominal joints have at their edges a faintly marked brown and oblique line; the last joint in the male moth is tipped with the same color, and if the fan-like tuft is partly extended, a number of black and brown hairs are visible. The under side of the body and the legs are white; the first pair of legs are ornamented by having the upper side and tips of first joint of tarsi yellowish-brown, with a golden luster; the second pair of legs have also sometimes the tips of the upper sides of their tibiæ marked with the same color.

NATURAL AND ARTIFICIAL REMEDIES.

The sudden and quite unexpected disappearance of these insects so soon after the first brood was mainly due to the attractiveness which

the electric light possesses to these moths. Untold numbers were thus destroyed and prevented from increasing, which otherwise would have been the case, since but one parasite is known to prey upon it. From caterpillars gathered out-doors, and which pupated June 25, one hymenopterous parasite issued August 2. This is a *Glypta*, and is closely allied to *rufiscutellaris*, Wesmael.

The best remedy, and one that suggests itself at once, is the trimming of the hedge at the proper time; that is, when the first indications of the presence of young caterpillars is noticeable. The trimmed shoots ought to be removed as soon as possible, at least before they have become dry, otherwise these very active caterpillars wlll undoubtedly find their way back to the hedge, and thus thwart the design. Applications of the various insecticides will also prove effective, and, owing to the protecting web of the worms, ought to be applied in form of a spray.

NOTES.

THE CHINCH BUG IN CALIFORNIA.

In Bulletin 17 of this division and also in the annual report for 1887 Mr. Howard has reviewed the subject of the Chinch Bug on the Pacific coast, and the summary of his investigation is to the effect that but three authentic occurrences of this insect have ever been known in the State of California. One was a single specimen collected in the vicinity of San Francisco in 1885 by Mr. Koebele. Another was a single specimen collected by some students of Johns Hopkins in 1884 (particular locality not known), and the third was the record by Mr. Uhler, of California as one of the States which this insect inhabits. Mr. Uhler afterwards wrote that the specimens which he had seen were collected near San Francisco, probably by Mr. Henry Edwards. The first two specimens mentioned were of a short-winged form which has been found only upon the Atlantic sea-coast, while Mr. Uhler states that his specimens were of the long-winged form. Letters addressed to Mr. Koebele in 1887 brought out the fact that he was not aware of the importance of his capture of this insect in 1885, and that he did not know just where he found the specimen referred to. Since the publication of the Bulletin, however, Mr. Koebele was reminded by its perusal of the fact that this specimen was collected upon the sea-coast, and the present spring he visited the shore near Alameda, with the result of finding a large number of specimens in the first, second, and third stages upon a coast grass which has not yet been named. Specimens have been sent for, and we hope soon to place the entire facts upon record. This large sending, however, places upon a firmer basis than ever before the occurrence of this insect in considerable numbers on the Pacific coast, although

there is as yet no evidence of any damage ever having been done in the State of California.

GERMAN PHYLLOXERA LAWS.

It may be of interest to reprint Mr. Max Leichtlin's rules for importing plants to Germany, as published in the Illustrated Monthly for General Interests of Horticulture. The directions are specifically for England, but will apply to America equally as well:

"Whoever wishes to import plants from England must instruct the nurseries to ship plants in cases, not in baskets, to pack each plant with its root-ball separately and tightly, so that they will not shake and loosen, and to enable the inspector to examine without injury to the contents. Ship through Ilse Sutton & Co., parcels express, or Best, Riley & Co., Holborn Viaduct, London, or any of their agents in the country who connect with Vlissingen. All freight suffers delay at Vlissingen. Let the shipper mark packages with the needed address of consignee, in care of T. T. Niessen, general agent, Kaldenkirchen, and prefix before consignor's domicile the word 'aus' (from), which are required custom-house formalities. If the consignees live in Heilbronn, the address should be 'f. i. N. N., ans Heilbronn, care of T.T. Niessen, general agent, Kaldenkirchen.' Finally consignee must write to T. T. Niessen, Kaldenkirchen, explaining that he is ready to pay for the phylloxera examination expenses and give him instructions how to forward, whether by freight, express, or mail."

Mr. Leichtlin says that he knows from experience that in following these directions as given the forwarding of plants will be swift, prompt, and reasonable. Any further information on the subject he says he will give with pleasure if needed.

KEROSENE EMULSION AGAINST THE CABBAGE-WORMS.

In our report for 1883, in summing up the different remedies which may be used against cabbage-worms, we mentioned the fact that for several years we had advocated the use of kerosene emulsion and stated that we were satisfied that it would prove of practical application in the field. In Bulletin No. 11 of this Division are recorded experiments by Mr. Webster, undertaken at our direction, which were favorable in their results. In accordance with this 1883 suggestion, Mr. F. E. Anderson, of the Pension Office in Washington, undertook to apply the emulsion upon his cabbages at his place, near Washington, and he has reported to us in full his results. They have not been published previously, through inadvertence, and we take this occasion to give them in his own words:

In accordance with your expressed wish to have a memorandum of my experience with kerosene as a destroyer of the Cabbage Worm, I now send you such a sketch as my memory affords.

It was in the spring of 1884 that I first put into active operation my long-desired gardening experiments. The soil was a warm sandy loam, favorable to vegetables, and I set out my cabbages—the Early Jersey Wakefields of Peter Henderson—near the end of April, there being about 400 plants. The season was exceedingly rainy, but toward the middle of June, as well as I can recollect, there came quite a severe drought, and at about this time the cabbage-flies began to appear. I had amused the neighboring farmers, who believed in "the good old ways of our fathers, sir," very much by my study of the Rural New Yorker and the reports of the Department of Agriculture, which, with Peter Henderson's "Gardening for Profit," were never out of my hands in my leisure moments; and the champions of ruts were gleeful over the anticipated failure of the "book-farmer," who, moreover, had only spare hours for his hobby and no help save his own hands. But I was not at all worried by their opinions. As soon as I saw the little white fellows making their staggering yet swift flights over my cabbages, I caught one, and recognizing him at once by the picture furnished in the report for 1883, as *Pieris rapæ*, I lost no time in preparing to give the enemy a warm reception. Not having a cow on the place, I varied Hubbard's formula by substituting common soap-suds for milk, and at dusk began to shower it upon my cabbages through an ordinary large-sized watering-pot. Owing to inexperience on my part and to the imperfect mixing of the two elements, I killed a few plants on this application, but the next evening I had learned better what to do and found myself succeeding well. In short, so complete was my victory—owing to prompt action and an early use of the remedy—that, apart from the cabbages spoilt by the first trial, I did not lose a plant. The only damage done by the worm was to a few outside leaves. As a consequence, I believe that kerosene as a destroying agent rests on a sound basis. All persons know how fatal any oil is to insects. Let a fly fall into bacon grease, for example, and though he may escape seemingly unhurt, follow him up and in a few seconds you will see him drop. The medical men remove beetles from the human ear by pouring in sweet oil. While I am no scientist, if I might venture a reason I would say that I believe it is deadly because it clogs up the breathing-pores of the insect. Kerosene well and carefully applied will do the same thing. Hence my opinion. If the application has injured plants it has been, I should judge, more through the ignorance or carelessness of the operator than through the fault of the formula.

Of course my experience is inconclusive of the matter, as I experimented on early cabbages, which are never so destructively assailed by the *Pieris rapæ* as the later varieties are, and since I was appointed to a clerkship in Washington before the season for fall cabbages was well under way; but I have tried to follow what I conceive to be the scientific method, namely, to state facts rather than fancies, no matter what results spring from them. If, in my rough way, I have gratified your wish I feel fully satisfied, for your long-continued kindness and that of Professor Riley (to say nothing of others who have shown me polite favors in your Department) have rendered me subject to obligations which I can only in part repay by signing myself,

Very sincerely, your friend,

FRANK E. ANDERSON.

P. S.—Notwithstanding my "book farmin'" you will be gratified to learn, doubtless, that I had the finest garden in my neighborhood, excepting only one, that of a rich man who could apply more fertilizer to the soil than I could.

SWARMING OF HACKBERRY BUTTERFLIES.

We have, in past years (3d Rep. Ins. Mo., pp. 151–2, Sc. American, April 6, 1878), treated of the migration of butterflies and of the exceptional swarming in immense numbers of several species, but have not known of a more striking case of exceptional abundance of a certain

species than was brought to our attention during 1887. The species in question is *Apatura celtis*, one of the Hackberry butterflies treated of at some length in the sixth report on the Insects of Missouri. The larvæ are found feeding upon the leaves of Celtis in the month of May, transform to chrysalids the latter part of the month, and issue as butterflies in the latitude of Saint Louis about the middle of June. A second brood of butterflies appears in August and the insect hibernates in the larva state at the surface of the ground.

The present spring, considerably south of the locality where we studied the species, an extraordinary swarming was noticed by two of our correspondents. Mr. Carl Holzgang, of Clay Center, Kans., wrote, under date of May 24:

> As I passed last Thursday (May 19) along the Mississippi Valley, west side, near Memphis, up the Arkansas, a swarm of millions of moths like the inclosed were flying along the road going south, etc.

On the same day (May 24) Mr. F. M. Webster, who was at that time in Arkansas, wrote as follows:

> With this I mail you * * * examples of what I take to be *Apatura celtis*. Never in my life have I observed such numbers of any species of butterfly as I saw of these along the Saint Francis River on the 14th and 15th of the present month. For a distance of about 30 miles the shores of the river were literally lined with them. On stumps they would be packed in so thick that with wings erect they completely covered the surface. The sides of the small steamer on which I was traveling were covered, and I counted 17 on the back of a deck hand as he was going about his work. When a landing was made and I got off to examine the brush, they would rise up in clouds about me and get into my eyes and mouth so that I had to beat about with a bush to protect myself. The engineer of the boat said he had been running on the river fifteen years, but never saw so many before. The inhabitants along the river were as surprised as myself. * * *

The swarming of this species in spring is the more interesting that in most other instances the swarming takes place in the autumn, and the only explanation of this exceptional phenomenon would seem to be that the conditions for successful hibernation of the larvæ were exceptionally favorable.

SOUTHWARD SPREAD OF THE ASPARAGUS-BEETLE.

The Imported Asparagus-beetle (*Crioceris asparagi* L.) is spreading gradually southward. Following the coast and the water-courses, it was found four years ago as far South as Cherrystone Creek, in Maryland, on Chesapeake Bay, by Mr. Otto Lugger, and during 1886 was found at Old Point Comfort, Virginia, by Mr. E. A. Schwarz. Inland it has spread more slowly, and never damaged asparagus beds in the vicinity of Washington until 1887. The farthest inland Southern point of which we have heard is Falls Church, Fairfax County, Va., where it did some damage in the spring of 1887.

CATERPILLARS STOPPING TRAINS—A NEWSPAPER EXAGGERATION.

The following correspondence will explain itself:

[C. V. Riley to A. P. Butler, Com. Agr., S. C., May 16, 1887.]

I inclose a clipping from this morning's Post. Can you tell me anything about the correctness of the statement?

[Clipping from Washington Post, May 15, 1887.]

COLUMBIA, S. C., *May* 15.

There are such myriads of cotton caterpillars in the Peedee Swamp, this State, that a mail train passing over the Peedee River trestle was brought to a standstill recently by thousands of these worms being on the rails and causing the wheels to slip.

[Col. A. P. Butler to Capt. C. M. Smith, agent C. C. and A. R. R., May 18, 1887.]

Please find inclosed herewith a clipping sent to this Department from Washington, D. C., from Prof. C. V. Riley, Entomologist of the United States Department of Agriculture. Is there any truth in the matter, and are the caterpillars as numerous as stated?

[Indorsements.]

Referred to J. R. Kenley, superintendent trains.—C. M. Smith.

Referred to J. F. Dunn, G. S.—J. R. Kenley.

I have had no report of a train being stopped by caterpillars.—J. R. Kenley, superintendent trains.

[John F. Dunn, general superintendent, to A. P. Butler, May 20.]

There are a great many caterpillars on the Peedee trestle, where the trains stop ordinarily on the track, and they make the track slippery, and engineers find some little difficulty in getting away, but nothing to stop the train.

INJURY BY THE ROCKY MOUNTAIN LOCUST.

Caloptenus spretus has appeared in large numbers in Otter Tail County, Minn., this year. Mr. Otto Lugger, who resigned his position as an assistant in this Division last May to accept the position of entomologist of the Minnesota State Agricultural Experiment Station, is busily engaged in superintending the work of destroying them, and will soon publish a report on this interesting outbreak. In a recent letter he informs us that the locusts are now (July 5) being killed and gathered at the rate of 500 bushels per day, persons employed for the purpose receiving the remuneration of $1 per bushel for their services. Mr. Lugger was connected with us several years in Missouri, and has for the past three years been one of our most satisfactory office assistants. He is thoroughly familiar with our methods of work, and exceedingly well posted on the habits of insects, especially those injurious to agriculture. He is, therefore, thoroughly equipped for his new post, and we congratulate Minnesota on having secured his services, which we shall miss in the work of the Division.

Early in the season we were led to hope for immunity from the Rocky Mountain Locust, as when the young first began to appear in Minne-

sota they were determined from Illinois as not the migratory species, but as belonging to some of the local non-migratory kinds. M. Lugger has had the hearty co-operation of the State authorities and especially of the governor of the State, and we shall look forward to his report with much interest.

THE PERIODICAL CICADA IN 1888.

During the present year two broods of the Periodical Cicada or so called "Seventeen-year Locust" (*Cicada septendecim*, L.), one of the seventeen-year (*septendecim*) race and one of the thirteen-year (*tredecim*) race, have made their appearance in different parts of the country.

The following is a list of localities in which they are supposed to have appeared, and we shall be pleased to receive any information, confirmatory or otherwise, from persons who may receive this bulletin, as we are desirous of definitely limiting the extent of country over which these broods appear.

BROOD V.—*Septendecim* (1854, 1871, 1888).

Wisconsin.—Waukesha, Walworth, Jefferson, Rock, Green, Dane (?), Iowa, Grant, Crawford, Richmond, Sauk Counties.

Iowa.—Mitchell, Howard, Winneshiek, Allamakee, Clayton, Fayette, Chickasaw, Floyd, Bremer, Butler (?), Dubuque, Delaware, Buchanan, Black Hawk, Jackson, Jones, Linn, Benton, Clinton, Scott, Cedar, Johnson, Muscatine, Louisa, and Des Moines Counties.

Illinois.—All of the northern counties. The boundary line, in a general way, may be drawn from the northwest portion of Mercer County, southeast to the Illinois River at Peoria, west along the Toledo, Wabash and Western Railroad. There seem to be detachments extending farther south, especially in the eastern portion of the State, and they occur as far south as Shelby County.

Indiana.—The boundary in this State is not well-defined, but includes the extreme northwest counties, extending as far south as the Kankakee River.

Michigan.—In this State the southern tier of counties extending from Lake Michigan east to the middle of the State.

Pennsylvania.—Lancaster County; the southeast by eastern portion, known as the "Pequea Valley." This locality was not verified in 1871, although there is no doubt of the appearance of the insect in immense numbers in 1854.

BROOD X.—*Tredecim* (1849, 1862, 1875, 1888).

Texas.—We are particularly desirous of verifying this brood. Its existence now rests on the single statement by Dr. Gideon Smith that he was informed that the insect appeared in vast numbers in parts of Texas in 1849, but that he was not able to get any particulars. 1875 did not furnish any information concerning this brood; hence our desire for full and accurate returns from Texas this year.

THE CHINCH BUG IN 1888.

The long continued rains extending over a large part of the Chinch Bug territory during the late spring and early summer the present season have done much to verify our prediction on page 31 of Bulle-

tin 17, that the present season will be one of comparative immunity from the attacks of this insect. We learned early in spring of the successful hibernation of the bugs in large numbers in Wisconsin, Minnesota, Iowa, Missouri, Kansas, and South Carolina, but later information shows that the heavy rains have killed them off in great numbers. July returns, however, show some slight damage. The two worst reports have come from Chesterfield, S. C., and Cadet, Mo., but these are not alarming.—L. O. H.

INCREASE AND DIVERGENT HABITS OF CRYPTOCEPHALUS VENUSTUS.

Mr. John D. Lyons writes us from Monticello, N. Y., that *Cryptocephalus venustus* has become very plentiful this year in that locality. It does not seem to do much damage to anything, but it is interesting to note that it is found on the Potato in preference to other plants, and on the Tomato, Pumpkin, and Cucumber if the Potato is not convenient.

THE HESSIAN FLY HALF-WAY AROUND THE WORLD.

The Hessian Fly, *Cecidomyia destructor*, has reached New Zealand The March, 1888, number of the *New Zealand Farmer* reports it from four different farms in the Rangitikei district, one of these being at Bellevue, near Marton, a town 33 miles southeast of Wanganui, in the state of Wellington.

EAU CELESTE FOR THE ROSE BEETLE.

It is interesting to note that the *eau celeste* (blue-water, a simple solution of sulphate of copper, with ammonia), recently recommended by this Department as a remedy for mildew, at the same time rids plants of the Rose Beetle when they are so infested. Col. A. W. Pearson, of New Jersey, states that it not only saved his vines from injury by mildew, but also rid them entirely of millions of these beetles, which were threatening to destroy the fruit and foliage entirely.

THE YELLOW-SPOTTED WILLOW-SLUG.

(*Nematus ventralis* Say.)

[Order HYMENOPTERA: Family TENTHREDINIDÆ.]

By L. O. HOWARD.

WILLOW AND WILLOW WARES.

The willow ware industry has been slowly increasing in our Eastern States of late years, but is as yet in its infancy. The immense unutilized areas of land along our many rivers, portions of the sea coast, and of some uplands and prairies not suitable for any other agricultural pursuit, invite capital and energy to invest in the production of osier, chiefly for the manufactury of basket ware. According to the census of 1880 there were in the country 304 willow-ware establishments, with a capital of $1,852,917, engaging 3,119 hands, paying annually the sum of $657,405 for wages, and producing $1,992,851. The value of materials consumed was $867,031, of which, however, but a portion was produced here. The importation of both raw and manufactured material will be greatly reduced, and the demand for willow ware materially increased if the profit to be derived from a systematic production of osier becomes once better generally understood.

The various species of willows, including those with tough twigs suitable for basket making, are greatly affected by insects, and one of the worst is this slug or saw-fly, observations upon which have been recorded in past years by Professor Riley in the New York Tribune for July 13, 1872, while his note-books contain records of many observations made in subsequent years. The following statements are drawn up from these notes and from others made by Mr. Lugger and myself during the summer of 1887:

NATURAL HISTORY.

If not checked by natural or artificial remedies, six or seven broods of this insect are possible in the Central and Southern States. Our records for 1886 show that these flies were abundant and depositing eggs

May 20, July 1, July 17, August 2, September 7, October 12, and October 19; full-grown larvæ were observed May 11, May 22, June 16, July 6, August 13, September 13, and October 14.

FIG. 5.—NEMATUS VENTRALIS. *a, a, a,* young larvæ; *b,* full-grown larva; *c,* cocoon; *d.* adult; all slightly enlarged (original).

In the grounds of the Agricultural Department in Washington these slugs were extremely abundant upon isolated willows on July 6; eggs were deposited July 17, which produced the second brood. A third brood became numerous August 2; eggs for the fourth brood were deposited September 7, and eggs for a fifth brood hatched October 14. No saw-flies had been observed during the previous year nor prior to July 6, thus showing that they came from some other willows, and that the larvæ then noticed were the offspring of females of a first or perhaps second brood, which had been forced to search for new breeding-places, the former food supply having become exhausted.

The number of broods on these isolated willows could be studied with great ease, since each brood of slugs consumed in turn nearly all the younger leaves in the course of their larval existence. Before the winged flies appeared and before their eggs had hatched, the young leaves and shoots had attained quite a size, and offered enough suitable food for a new brood to feed to full growth. In larger patches of willows such observations are more difficult, because in the course of time the several broods overlap each other, so that in late summer slugs of all sizes can be found at the same time, and there is no indication of the brood to which they belong.

INJURIES AND APPEARANCE OF SLUGS.

All kinds of willows, with the exception, perhaps, of the weeping willow and species growing into tall trees, are injured by these slugs; the imported yellow or golden osier willows do not escape. Yet the species and varieties of the white willow seem to be preferred, at least they are first attacked if a variety of food is offered. Young poplars growing in close proximity to the willows, were injured as well, and only their older and harder leaves escaped. Such poplar leaves, frequently utilized by the female saw-flies for oviposition, were not used as food until the willow leaves became scarce and hunger forced the slugs to search for other food plants allied to willow. Nor are eggs inserted into poplar leaves until willow leaves for this purpose are lacking. The greatest damage is done to young plants, and this is one redeeming character of this insect, as insecticides are much more readily applied to them.

The defoliation of the young willow plants is bad enough by itself, and if repeated several times in the same season or in consecutive seasons will no doubt kill them. But still another injury is inflicted which renders such defoliated twigs useless as osier. Whenever the plant is forced to produce a new set of foliage the new leaves do not simply replace the lost ones, but grow from new side shoots, thus destroying the usefulness of the original shoot, which for commercial purposes should be of uniform texture throughout its whole length.

The first indication of the presence of these slugs on the willows is the peculiar little blister like swellings seen upon the upper surface of the leaves and which sometimes give them a wavy or crumpled appearance. If an individual leaf is investigated these swellings are seen to be occasioned by the oval, whitish eggs, which are partly inserted into the under surface of the leaf-substance. As the eggs approach the time of hatching black spots and streaks appear around them, which are the effects of the numerous wounds made upon the leaves. As soon as the young slugs appear they commence to gnaw small holes, which soon increase in size. The numerous slugs born in the same leaf feed usually in close proximity to each other, but they can not, however, be called gregarious. Their slimy black color and filthy moist excrement soon reveal their presence. As they grow in size they devour the whole leaf and soon denude the plant, leaving only the thicker portions of the mid-ribs untouched. The slugs make no attempt whatever to hide, in spite of their conspicuous markings, but are plainly visible everywhere. They can always be distinguished by the peculiar curved position of the posterior segments, which frequently bend away from their true legs in the form of an interrogation mark.

THE DIFFERENT STAGES.

The Egg.—As in the great majority of saw-flies, the female of this species is provided with two saws under the posterior part of the abdo-

men, which are used to cut fine slits into the leaf-substance, into which the eggs are pushed. Here they increase to almost twice their original size by absorbing the sap of the plant through their very thin shells, thus preventing their dislodgment until hatching time. The under side of the leaf is invariably utilized for oviposition. The appearance of oval bladder-like projections upon the upper surface of the leaf is produced by the eggs, as already mentioned. They show still more plainly upon the lower surface, where it is seen that the eggs are only partly imbedded in the little pockets produced by the saws of the female. If the leaf substance at the time of cutting these slits is still soft and yielding the whole egg is snugly imbedded; otherwise one-third and even one-half of the egg projects outside. The egg itself is quite large in proportion to the mother insect, measuring fully 0.3^{mm}. in length. It has a long oval shape and is one-third as wide as long. These translucent, greenish eggs are quite numerous, as each female lays on an average about eighty eggs at a time, and since—in time of scarcity of young foliage—several females sometimes select the same leaf, as many as two hundred eggs have been counted upon a single leaf. The eggs deposited later in these leaves by a second female are usually destroyed, because the offspring of the first batch of eggs commence feeding as soon as born and devour the leaf, together with the inclosed eggs. In the course of four to eight days the young slugs are hatched. The time of incubation varies and is controlled by the prevailing temperature.

The Larva, Pupa, and Cocoon.—When the young larvæ leave their egg-shells, they are at first white, with a small blackish eye-spot on each side of the head, which is already visible through the shell of the unhatched egg. This white color soon disappears, and later the slugs are shiny black, transversely wrinkled, and ornamented with ten large and two smaller yellow spots on each side of the body along the stigmatal region. A slimy matter oozes out of their skin and covers them entirely. The large yellow spots are very prominent only after the last molt; but they are already vaguely indicated in the younger specimens, which are moreover frequently marked by a narrow, yellow longitudinal dorsal line. Often there are but ten spots, the ones upon the first thoracic and last abdominal segment being either quite small or lacking. The head is polished black, free, perpendicular, and as large as the first segment. Besides the three pairs of long, black, jointed feet, of which the first pair is shortest and the third longest, the slugs possess six pairs of light blue prolegs and a seventh pair of very imperfect anal ones.

The larvæ undergo four molts, and attain maturity in from ten days to three weeks. When full grown, they measure fully 20^{mm} in length, and ceasing to feed, enter the ground where they form shiny, glue-like cocoons, of a dark bronze color. These cocoons are double, and consist of a rough outside layer inclosing a smooth and tough

inner one. If larvæ of this species are confined to breeding cages without earth, they form their cocoons among or under the dead and fallen leaves. Within these cocoons they change to yellow pupæ, which in the course of a week give forth the winged insects.

The Imago.—The winged insects are dull and heavy in all their motions, and depart greatly—like most saw-flies—from the general character of the order to which they belong. They possess neither the powerful jaws of the predaceous tribes, nor the slender jaws and tongues of the honey-feeding families. When the females are engaged in sawing slits in the leaves for the reception of their eggs, they are not easily disturbed in their work. The males, however, are more active, being one third shorter, and not as bulky as their females. The color of both sexes is black; the female has the venter, tibiæ, palpi, and the base of the wings of a decidedly bluish-green color; the edges of the abdomen and obsolete bands between the segments are pale yellowish. The same parts in the male, and more or less of the upper surface of the abdomen, are yellowish-brown or orange colored. The female averages 8^{mm} in length and the male 6^{mm}.

NATURAL ENEMIES AND REMEDIES.

No parasite has as yet been found to attack the larvæ. The eggs however, are frequently destroyed by very small Chalcids of the genus *Trichogramma* which become numerous when the second brood of females is ovipositing.

The Wheel-bug (*Prionidus cristatus*) has been of very great service in reducing the numbers of these slugs. At a time during the summer of 1887, when the willows were threatened with total extinction, a number of these useful bugs stationed themselves upon the infested twigs and impaled every slug that could be found upon the same twig. Towards the end of the fourth generation the willows recovered somewhat and put out new foliage, and the slugs became so very scarce that the Wheel-bugs found it no longer profitable to remain.

The English Sparrows, although flocking in large numbers to some sun-flowers that grew very close to and among the willows did not eat a single slug; their whole attention was directed to the ripening seeds of the Sun-flower.

As to remedies, no insect is more readily destroyed than this by the use of arsenical solutions.

NOTES ON EUMAEUS ATALA.

By E. A. Schwarz.

By far the most conspicuous insect in semitropical Florida is *Eumaeus atala*, a butterfly which on account of its abundance and brilliancy in coloration can not fail to attract at once the attention of the en-

tomological visitor. The structural peculiarities of the larva and pupa of *Eumaeus* have been discussed by Mr. Samuel H. Scudder,* but he hardly refers to the life history of the species. Another description of the earlier stages seems to be given by F. Poey in his work on the Lepidoptera of Cuba, but I have not been able to consult the work. It is not quoted by Scudder but may contain a full account of the life history of *Eumaeus*. At any rate, even if duplicated, it will do no harm to place on record the following short observations made independently last year during a stay at Cocoanut Grove, Dade County, Fla.

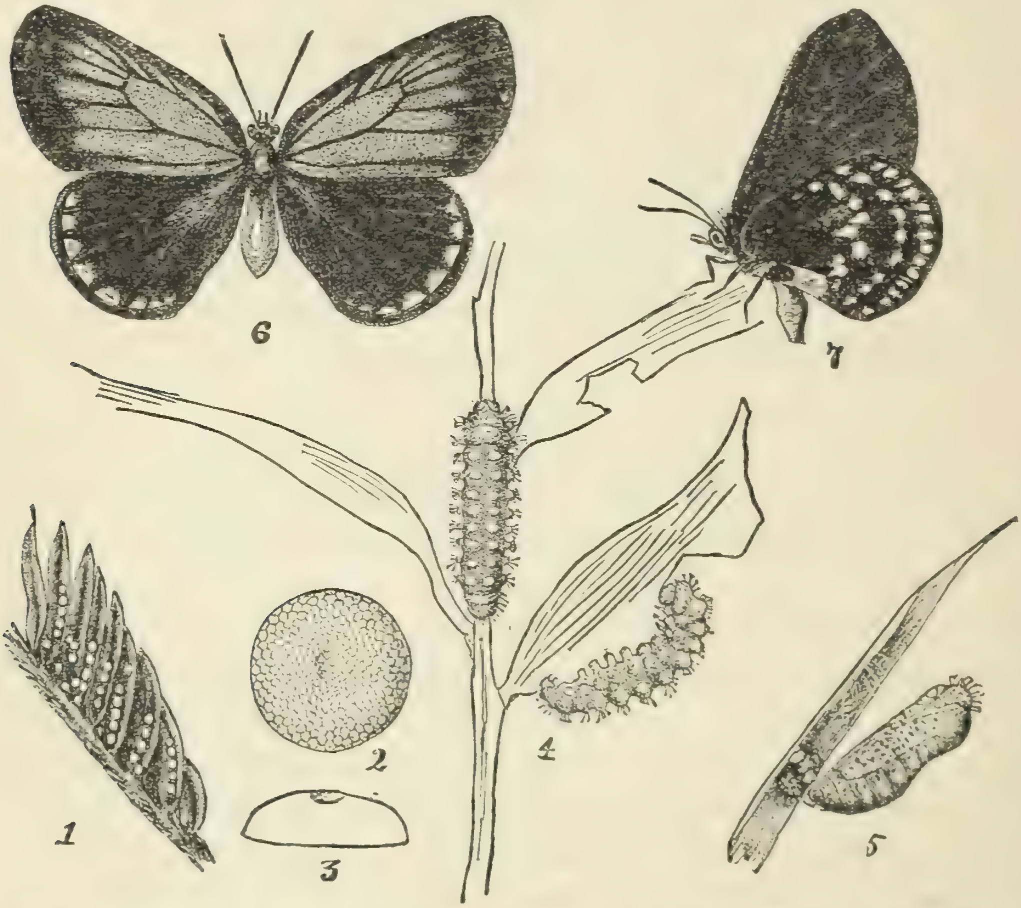

Fig. 6. Eumaeus atala: 1, eggs in situ—natural size; 2, 3 eggs—enlarged; 4, larva; 5, pupa; 6 adult from above; 7, adult from side—all natural size (original).

The species is so frequent and so tame in the pine woods between the shores of Biscayne Bay and the Everglades that it is the easiest thing in the world to gather some observations on its natural history. Its only food-plant in Florida is *Zamia integrifolia* of the family *Cycadacea*, a plant which is not unlike a large fern and whose original home is the West Indies. That this plant is of considerable economic value wherever it occurs in abundance is a well-known fact, but it may not be generally known that it furnishes almost the only means of subsistence of the present population of the shores of Biscayne Bay and of the mainland southward thereof. The subterranean stem of the plant, when ground up by means of very simple and cheap machinery, fur-

* The structure and transformation of *Eumaeus atala*. Memoirs Boston Soc. Nat. Hist., vol. ii, pt. iv, No. iii, 1875, p. 413–419, pl. xiv.

nishes a starch of excellent quality, and this when shipped to Key West, the emporium of southern Florida, always commands a good price in cash. The larva of *Eumaeus atala*, which is popularly known as "Coontie Worm,"* would therefore be an injurious insect, since it often entirely defoliates large bushes of the *Zamia*, but the plant is so abundant and possesses such indestructible vitality that the damage is reduced to a minimum.

The brilliant red larvæ abound everywhere on the plants, and if they have not defoliated the latter, the cream-colored, echiniform eggs, or rather the egg-shells, may be easily found by examining the under side of the leaves. Here they are in more or less regular rows of three or four or even five upon each leaflet, and there is also sometimes a regular row of eggs along the main rib of the leaf. The butterfly, however, never oviposits on such fully developed leaves, but always chooses the young shoots when these are still curled up and the leaflets closely folded together.

The female butterfly alights upon a young shoot and the leaf bends down under the weight of the insect, which thus remains with its legs upwards when ovipositing. It takes a long time before the female has selected a suitable place for the depositing the egg, and this is finally laid with a great effort, so that the insect has to rest for two or three minutes before going on with her work. The second egg is laid close to the first, and usually a third and sometimes also a fourth or fifth are laid in a row on the same leaflet. Then the female proceeds to the next leaflet above or beneath the first, or chooses another one, but always close to the first place. I timed a female which had just laid one egg, and found that thirty-two minutes afterwards she had laid only 13 additional eggs. The number of eggs to be found on a single leaf varies greatly; sometimes only two or three are found (the insect having evidently been disturbed by a sudden gust of wind or otherwise), but usually much more, and as many as thirty-five were counted. When the female has finished ovipositing the leaf gets again erect, and thus the eggs are first on the upper and outer sides of the leaf, but in the course of a few days the leaf unfurls and the eggs, long before they hatch, are on the under side of the leaflets. With the expanse of the leaflets the intervals between the individual eggs increase, and the rows of eggs do not longer appear so regular as when the leaflets were still closed.

Duration of the egg state in the month of May at least ten days; that of the larva at least a fortnight; the pupa state lasts between nine and ten days. During the month of May the species could be found in all stages in the pine woods along the shores of Biscayne Bay, and it seems that in the mild climate of that section it breeds the whole year round.

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* "Coontie" is the Indian name for Zamia integrifolia; the white settlers call the plant "Contie" or "Comtie."

Although, on account of the prevalence of the house ant (*Monomorium pharaonis*), I was unable to breed indoors the butterfly from the egg, still I bred many imagos from the half or nearly full-grown larvæ, and frequently young larvæ from the eggs, but in no instance did I obtain a single parasite from the eggs, larvæ or pupæ. The butterfly seems likewise to enjoy perfect immunity from natural enemies, since it can be readily approached and captured with the hand. Still, nature has provided against an undue multiplication of this butterfly. If plenty of young shoots happen to be on one plant every one of these, or at any rate most of them, are covered with the eggs, and the caterpillars have defoliated the plant long before they are full grown. They then begin to migrate in search of new food, not in a body, but scattering in all directions, and, since the plants are usually not so very close together and the rocky ground most unfavorable for locomotion, most of these migrating caterpillars perish from starvation. Moreover, untold thousands of them are destroyed by the fires which frequently sweep through the pinewoods.

In regard to the geographical distribution of *Eumæus* Mr. Scudder has already pointed out that it does not extend so far north as its food-plant. This last occurs still around Crescent City, but the butterfly is even no longer to be found on the southern end of the Indian River, nor did I see it in the pine woods opposite Lake Worth. It was still quite abundant about 3 or 4 miles north of Miami River, but here the coral formation rapidly sinks below the level of the ground, and the pine woods assume the character of what is known as "flat woods," where *Zamia* does not occur. It is thus safe to assume that *Eumæus atala* does not attain the northern end of Biscayne Bay. Scudder mentions its occurrence on Key Biscayne, which is almost due east of the mouth of Miami River, but I think this must be a mistake, since the narrow strip of sand which forms Key Biscayne did not harbor at the time of my visit a single specimen of the food-plant. Southward it occurs on Elliott's Key and Key Largo and on the mainland perhaps so far south as Cape Sable, but is absent on most of the smaller keys south of Key Largo. In southwestern Florida, as I have been informed, the food-plant extends so far north as the still *terra incognita*. I can not tell whether or not the butterfly occurs there.

The accompanying figure, which Professor Riley has had drawn by Miss L. Sullivan, does not need any further explanation, nor is it the intention of the writer to enter here into descriptive details. The silken thread which girdles the pupa has been accidentally omitted in the photo-electrotype.

SUPPLEMENTARY REPORT ON THE GAS TREATMENT FOR SCALE INSECTS.

By D. W. Coquillett.

Since writing my "Report on the gas treatment for scale insects," which forms part of Professor Riley's annual report, published in the Report of the Department of Agriculture for the year 1887 (pp. 123–142), I have made a number of observations on this treatment, the more important of which are recorded below.

There is a great difference in the relative strengths of the best grade of the various brands of potassium cyanide. In this city (Los Angeles) the two brands most commonly offered for sale are the Powers & Weightman, manufactured at Philadelphia, Pa., and the Mallinekrodt, manufactured at Saint Louis, Mo. A careful analysis of each of these brands by Prof. E. M. Wade, an analytical chemist of this city, showed the Powers & Weightman cyanide to contain fully 99 per cent. of pure potassium cyanide (KCN), while the Mallinekrodt contained only a fraction over 93 per cent.; and several experiments which I have made with each of these brands fully confirm the correctness of the above analyses in favor of the Powers & Weightman cyanide.

Either of these brands of cyanide will dissolve in a few hours in cold water, only requiring to be frequently stirred. When thus dissolved, the solution does not emit the disagreeable odor of ammonia, which is emitted by the solution made by boiling. The solution made without heat is evidently stronger than the other, since heat decomposes the cyanide; and several tests which I have made with the cold solution indicate that it is stronger than when made by boiling. Moreover, the cold solution is more liable to be of a uniform strength, since in the other the boiling water will take up more of the cyanide than it can retain, and upon cooling will deposit the excess in the bottom of the vessel.

The Powers & Weightman cyanide will dissolve in about half the time required by the Mallinekrodt. The latter solution, after standing a few hours, assumes a reddish-brown color, but the solution of the Powers & Weightman cyanide does not change color, remaining of a light, olive-gray color for an indefinite length of time.

The proportions are as given in my report, namely, 5 pounds of the cyanide to 1 gallon of water. When dissolved, the solution will measure about 168 fluid ounces, each pound of the cyanide having added 8 fluid ounces to the solution. Two fluid ounces of the solution will contain about 1 ounce by weight of the cyanide, and will require 1 fluid ounce of sulphuric acid (commercial) to evolve the gas from them. One ounce by weight of the dry cyanide will require about 2¼ fluid ounces of sulphuric acid to evolve the gas from it.

A wholesale firm in this city offer to furnish either of the brands of cyanide mentioned above at the rate of 65 cents per pound when purchased in quantities.

The second or drying vessel of the gas generator should be much larger than the one shown in Plate VI of my report. This vessel should be at least 10 inches in diameter. The leaden pipe which conveys the gas from the generator proper to this second vessel should enter one side of the latter near the top and then curve downward until its lower end is within about an inch of the bottom of the vessel. When in use the bottom of this vessel should be covered with sulphuric acid to a depth of 3 inches, and after the gas has passed through it enough of the acid should be drawn out of this vessel to generate the gas the next time, and fresh acid be added to replace that drawn out.

The generator proper should be furnished with *two* vessels above, instead of one—one for the acid and the other for the solution.

EXTERNAL SPIDER PARASITES.

By L. O. Howard.

In Hardwicke's Science Gossip for July, 1888, a spider from Ceylon is figured with a parasitic Ichneumonid larva *in situ* upon its back. The adult parasite is also figured, and the accompanying note, which is by Mr. E. Ernest Green, of Pundiloya, Ceylon, states that the Ichneumon appears to oviposit upon the female spiders only, and that the spider continues to feed and remains in apparently good health until the larva is full-grown. The larva then spins a flask-shaped silken cocoon and attaches it to a leaf. No identification of the spider or the parasite is made by Mr. Green, although he states that the latter is possibly allied to the Pimpla mentioned by Packard as being parasitic upon a spider in Europe. A glance at his figure, however, shows that the parasite belongs to the Ichneumonid genus *Polysphincta*, the species of which are well known to be parasitic upon spiders, their larvæ feeding externally, as pointed out by Mr. E. A. Fitch in the Entomologist some six years ago. A similar case in America was for the first time mentioned by the writer in a communication to the Entomological Society of Washington, not yet published. In this case the parasitic larva was apparently less than half grown, and it was killed without rearing the adult. The specimen was captured by Dr. W. H. Fox, of Washington, in February, which would indicate a larval hibernation of the parasite. Dr. Fox's larva differed greatly from the full grown *Polysphincta* larva as figured by Fitch, but this may be due to the fact that it had not reached half its ultimate size. The spider upon which it

was found was a young specimen of *Steadota borealis* Hentz. The larva was slender, cylindrical, white, 1 millimeter in length, and was very firmly attached to the front of the dorsum of the abdomen of the spider in a transverse position. Mr. Fitch, in the article above mentioned, quotes observations by De Geer, Westwood, Blackwall, Laboulbène, Snellen van Vollenhoven, Brischke, and Parfitt, and records two new instances from specimens found by Rev. H. Matthews and Mr. G. C. Bignell. In the same volume Rev. O. P. Cambridge records two further instances from his own observations.

It is a very common thing to rear parasites from the egg-bags of spiders, but much rarer to find parasitic larvæ feeding upon the adult spiders; still from the instances mentioned above such cases have not infrequently been observed in Europe. Mr. Fitch makes the sweeping statement that the species of the genera *Polysphincta* and *Acrodactyla* "are probably exclusively spider vampires," and so positively does he rely on this generalization that he states that Brischke's record of *Polysphincta carbonarius* from a saw-fly is probably an error. In this, however, he is probably at fault, for there are other European records of the rearing of *Polysphincta* from saw-flies and from longicorn larvæ, and in this country Professor Riley has several species of this genus which have been bred from lepidopterous larvæ. Moreover, the *P. albipes* of Cresson was bred by Comstock from a lepidopterous cocoon found on an orange leaf in Florida (Rept. Dept. Agr., 1879, p. 208).

THE SWEET-POTATO SAW-FLY.

(*Schizocerus ebenus* Norton.)

[Order HYMENOPTERA; family TENTHREDINIDÆ.]

In the summer of 1886 Mr. C. Wercklé, of Ocean Springs, Miss., wrote us that a neighbor was troubled with worms which destroyed his sweet-potato crop, and in August, 1887, he was able to secure specimens, which he forwarded to the Division, and from which we were enabled to determine the insect as a rather rare Saw-fly, described by Norton in 1867 from male specimens collected in New York as *Schizocerus ebenus* (see Trans. Amer. Entom. Soc., Vol. I, page 55). The first installment sent by Mr. Wercklé consisted of pupæ only. These were received August 18, 1887, and from them adults issued August 19. September 6 larvæ were received from him, possibly of another brood, and from these adults issued September 19. We also, at the same time, reared from the cocoons a Braconid parasite belonging to the genus *Eubadizon*, differing from any species of this genus hitherto described in this country and which we shall describe in a more appropriate place

under the name *Eubadizon schizoceri.* It is illustrated at Fig. 8. We also reared an undetermined Tachinid. Mr. Wercklé also stated in one of his letters that the eggs were laid in the leaves and looked like

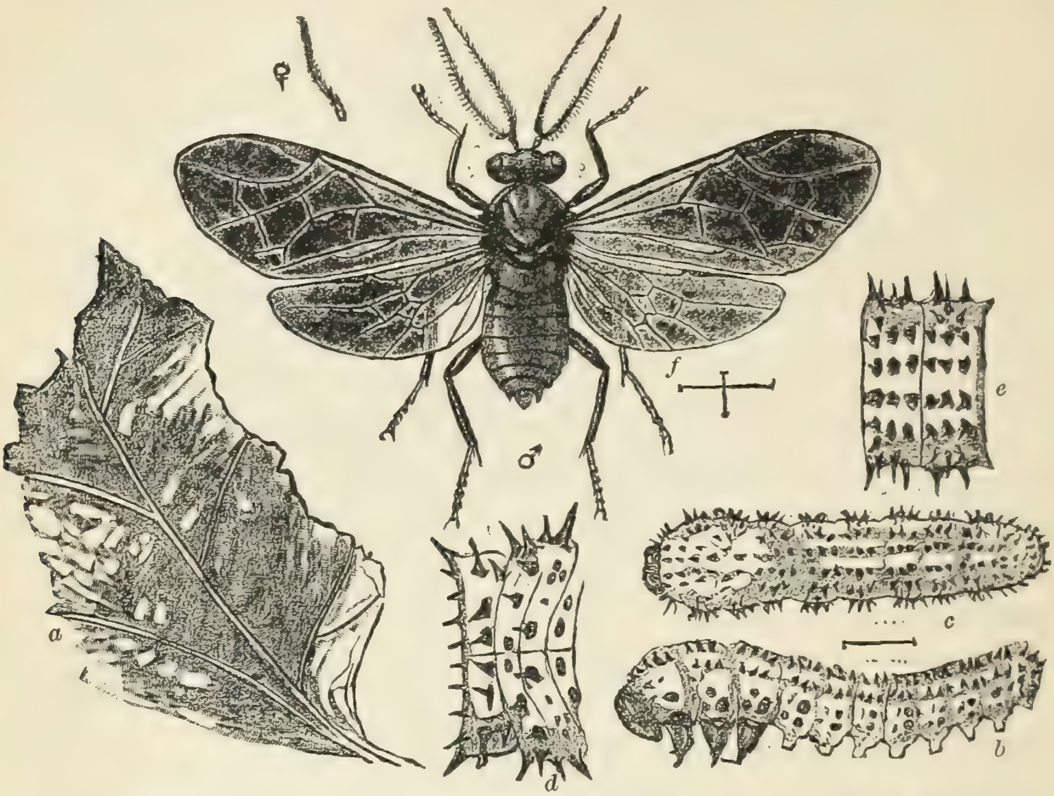

FIG. 7. SCHIZOCERUS EBENUS. *a*, leaf showing eggs in situ—natural size; *b*, larvæ from side; *c*, same from above—enlarged; *d*, thoracic segments of same; *e*, abdominal segments—still more enlarged; *f*, adult male—enlarged (original).

rows of scale insects. The pest was observed for the first time in 1886, when the larvæ completely defoliated large tracts in a sweet-potato field on a farm lying at some distance from any other.

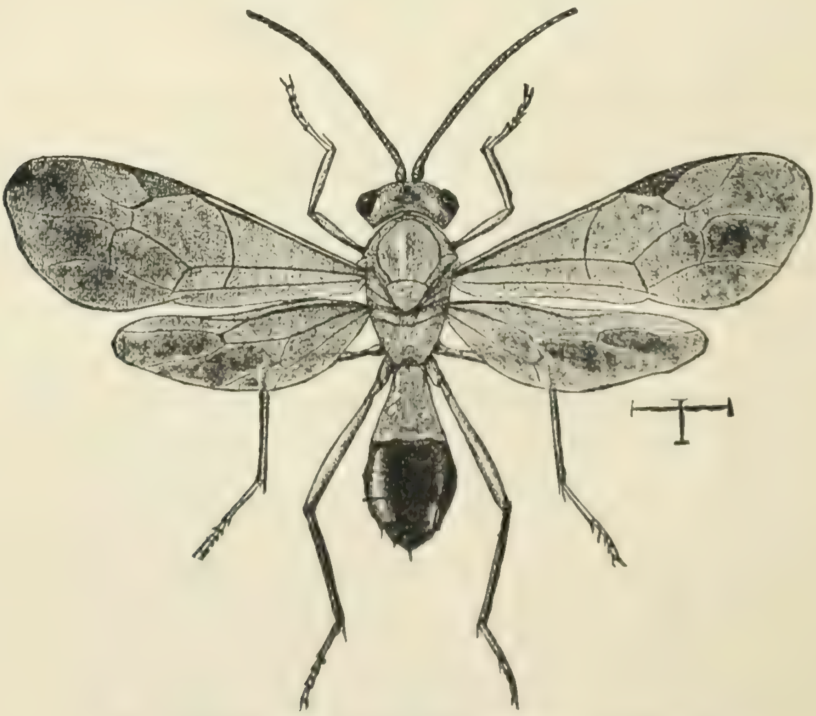

FIG. 8. EUBADIZON SCHIZOCERI, enlarged (original).

The present season (1888) Mr. Wercklé writes us that the pest has not been noticed since September, 1887. The adult insect is a small

four-winged creature, about the size of a common house-fly or a little smaller. It is black, and the wings are dusky. The female abdomen is yellowish-brown. The insect is shown in figure 7 in egg, larva, and adult. The larvæ figured are, however, not full grown. We mention this pest here but briefly, as our observations upon it are by no means complete, and simply to place the fact on record and to elicit any information which others may possess upon the subject.

THE MORELOS ORANGE FRUIT-WORM.

(*Trypeta ludens* Loew.)

[Order DIPTERA: Family TRYPETIDÆ.]

By C. V. RILEY.

We have for some time been aware of the existence in Mexico of a worm which damages the fruit of the Orange, boring into the pulp and rendering it unfit for eating purposes. It has been described to us by non-naturalists as a large, white worm of perhaps an inch in length, of which no sign could be seen from the outside of the fruit. The existence of such a fruit-worm in Mexico has always seemed important to

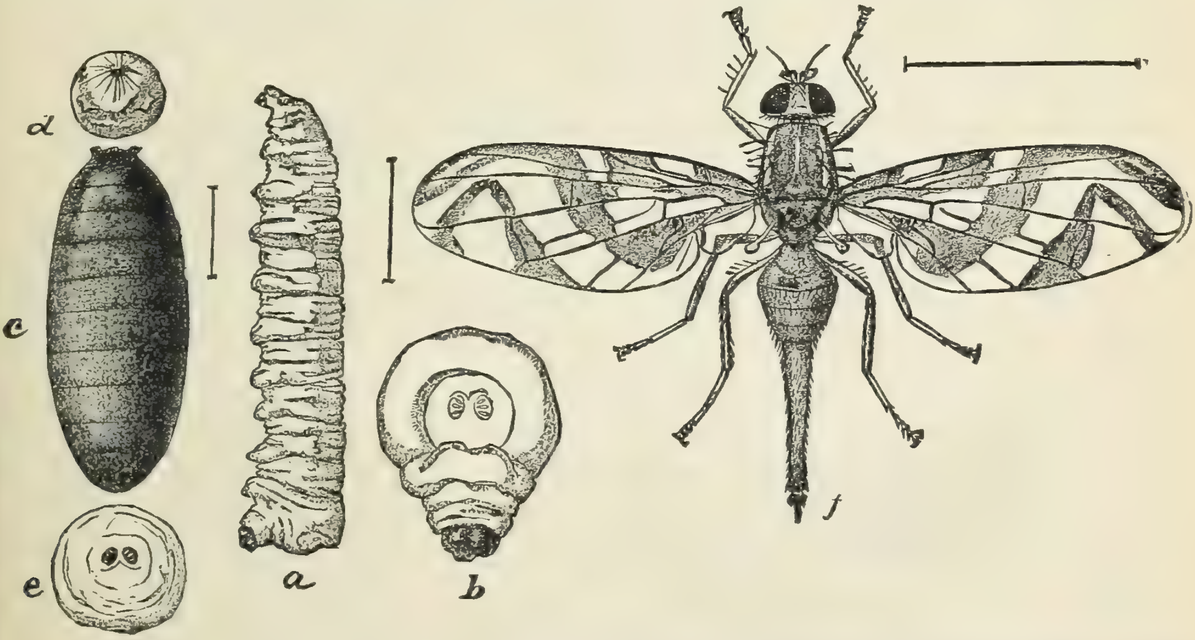

FIG. 9.—TRYPETA LUDENS. *a*, larva enlarged; *b*, anal segment of same form behind—still more enlarged; *c*, puparium—enlarged; *d*, *e*, head and anal segments of same—still more enlarged; *f*, adult female—enlarged (original).

us on account of the danger of importation into the orange-growing regions of the United States, and we have several times instructed our agents who were visiting New Orleans, into the markets of which Mexican oranges are largely imported, to search for infested fruit. Mr. Howard in 1884 ascertained that the fruit dealers in New Orleans were familiar with the existence of such a worm, but during the time at his disposal he was unable to obtain specimens. In the summer of 1887, however,

Mr. Bruner went to Mexico upon leave of absence for a collecting trip, and was urged, incidentally to the other objects of his trip, to look into this matter and to secure specimens, if possible, of the worm in question. He ascertained from conversation with intelligent Mexicans that there were probably three worms which injured the fruit of the Orange in that country. The one was a worm which works only in the skin of the fruit in the States of Michoacan and Jalisco, but which, from description, appeared to be a Tortricid. Another worm was described as being short and thick and working inside the fruit in the same States. He was unable to learn of any work in the fruit in the States bordering upon the Gulf of Mexico. The third worm was found by Mr. Bruner, and the imago obtained from specimens which he brought home. These proved to be *Trypeta ludens*, according to Loew's excellent description and figure.* The notes made by Mr. Bruner upon finding the first specimens are as follows:

"Upon opening an orange to eat it was found to contain a couple of holes immediately under the skin, penetrating into the interior. Further investigation showed the orange to contain eight dipterous maggots measuring 10^{mm}. in length. A careful examination of the outside surface revealed no signs of entrance, but the inner pulp of the peel contained a minute perpendicular burrow, which was continuous with that of the hole in the interior of the fruit. The eggs were evidently deposited in one of the pores of the skin or upon its surface, from which the freshly-hatched maggots entered."

The following note was sent to us after his return to West Point:

"The second orange containing the maggots that came to my notice was on the train. This, like the preceding, showed no outward signs of occupancy by an insect enemy. I then obtained permission to examine a lot of upwards of five hundred oranges coming from the same locality, out of which four were selected as such that might contain the worms. All of these latter showed more or less well-defined outward signs of the depredations of some insect enemy. One of these at least I am sure contains the grub, for upon my arrival home I found a freshly-made hole coming to the surface and saw one of the maggots protruding, that afterwards was made to re-enter. The oranges were placed in jars to breed the flies. Would forward some of them to you only that the weather has again turned quite cold and I am afraid to risk them in transit."

So far as Mr. Bruner was able to ascertain, this worm is most abundant in the oranges raised in the State of Morelos, 100 miles south of the City of Mexico, and the statement was made to him while in the City of Mexico that oranges from Morelos were very liable to be thus infested. Mr. Bruner returned to Nebraska early in December, and upon December 30 wrote us that several of the larvæ had pupated. The larvæ be-

* Review of N. A. Trypetina, Mon. Dipt. N. A., Part III, Sm. Inst., 1873, p. 223, Pl. XI, Fig. 19.

gan to issue from the fruit December 22. The fruit itself had rotted and molded, and about one-half the pulp had been devoured, although the outside did not show it. In this particular orange the spot where the decay began was where the fruit came in contact with the moist sand at the bottom of the breeding-jar.

In February he wrote that the adults had begun to issue, the first one appearing February 9. A number of specimens of both sexes were thus reared, and the experiment was tried of confining them with ripe fruit to see whether they would oviposit in the orange if not on the tree. This experiment, however, failed, and none of the flies laid eggs, all dying after a number of days. It is doubtful, however, whether this can be taken as evidence against the possibility of damage to picked fruit.

The larva, pupa, and adult of the insect are illustrated at figure 9, and these figures will enable the ready identification of the insect, so that few words of description are necessary. The full-grown larva is three-eighths of an inch in length, of a dirty white color, with the extremities brownish. Its shape is shown in the figure, and it may be readily distinguished from other larvæ so far known to affect oranges by the two anal spiracles, each with its three transverse slits. The puparium is shorter, oval, and of a dark-brown color. The general color of the perfect fly is ochre yellow, with slightly darker markings, as indicated in the figure. The markings on the wings are yellowish toward base and smoky toward tip.

There is little to say upon the subject of the possibility or probability of the introduction of this pest into the orange districts of Louisiana, California, and Florida. The fly is very hardy, and Mr. Bruner states that while in confinement it withstood considerable neglect, as well as more than ordinary variation in temperature, the mercury on several occasions falling some degrees below the freezing point in the room where his breeding-cage stood. So far as we can learn the New Orleans markets are mostly supplied with fruit from the Gulf States, where this insect does not occur, and the oranges from Morelos go north by railroad into the regions widely remote from any American orange-growing section, so that the probability of introduction would not seem to be great, although the possibility always exists and is becoming greater with the extension of railroad connection and facilities for traffic.

The habits of this species do not seem to have been described before. *Ceratitis capitata* (= *C. citriperda*), however, a species of the same family, attacks oranges in Madeira, according to Osten-Sacken (Entom. Monthly Mag., xxi, 34, July, 1884).

KEROSENE EMULSION AS A REMEDY FOR WHITE GRUBS.*

On June 1, last, Mr. Cogan, superintendent of lawns at the Capitol grounds, brought to the Division specimens of the larvæ of *Allorhina nitida* and stated that they were doing serious injury to the lawns under his care. This afforded an excellent opportunity for experimenting with kerosene emulsion, and Mr. W. B. Alwood was instructed to visit the grounds at once and to conduct a careful series of experiments and observations. The results have proved most satisfactory and there seems little question but that we have found a certain and easy remedy for these destructive creatures. The ordinary White Grubs (larvæ of *Lachnosterna* spp.) will unquestionably be affected in the same way. We give Mr. Alwood's report in his own words:

REPORT BY W. B. ALWOOD.

The plat affected was of irregular outline; on a large portion of it the grass was already killed and a considerable portion of this was bare of herbage of any kind. The soil was everywhere full of worms, averaging about six to the square foot of earth.

A small plat was treated with kerosene emulsion diluted fifteen times.

June 7, visited the grounds again. Where the keresene emulsion had been used the grubs had been immediately sickened and were now lying 2 to 4 inches below the surface, not eating. Mr. Cogan said that the next day after the treatment he had dug up several grubs which were sick and soon died *when exposed to the air and sunshine.* I found no dead ones in the soil. The grass was uninjured. This treatment seemed promising and on the 8th of June, under direction of this Division, Mr. Cogan treated the entire area with kerosene emulsion diluted fifteen times. For this purpose 15 gallons of emulsion were prepared, requiring 10 gallons of oil, and about 5 pounds of soap were used. This would give some 300 gallons of diluted wash. This was applied liberally to the soil, which was for some days kept freely soaked with water.

June 11 I visited the grounds again. The grubs over the whole area had turned down into the soil and seemed sick; when dug out were so weak they could scarcely crawl.

No dead ones were found. The green grass had not been injured by the application. Mr. Cogan was requested to keep the soil well watered and observe what further results followed.

On June 27 the grounds were again visited. The grass which was not killed by the grubs had recovered very much; where grass had been killed wild grass and weeds are growing in. The grubs are still in the

*The "White Grubs" in this instance are larvæ of *Allorhina nitida*. See note by C. V. Riley in Le Baron's fourth report as State Entomologist of Illinois, p. 90. See also note on the habits of these larvæ in Washington, by L. O. Howard, Canadian Entomologist, 1879, p. 200; also in American Naturalist, 1882, p. 411.

soil, but are weak and almost inactive; have a dirty-yellow color and occasional black spots. Saw no dead ones. Around margins of plat treated and in other places found the larvæ abundant and doing injury.

The lawn was not visited again until July 27. At this time I could not find Mr. Cogan, so no complete examination was made. No grubs could be found in the surface soil of the plat treated; elsewhere they were abundant, but no steps had been taken to check them.

July 31, went to the Capitol and Mr. Cogan and myself, with the assistance of a laborer, made a full examination of the plat treated. No grubs were found in the surface soil, but on spading down 8 to 12 inches some were found; further search showed them at a depth of 16 inches. Careful examination of about 3 square feet of surface to a depth of 16 inches brought to light fourteen grubs, all dead and discolored, as before mentioned. Not a living larva was found by examination on the treated plat. A spot nine paces to one side of the treated plat was examined and here grubs were found about as numercus as before, a few of which were dead and showed the same discoloration before mentioned. We then examined a spot 150 feet from the treated plat and found the grubs very numerous, some thirty being counted on 3 square feet examined. These were in no wise affected, tending to prove that those found in second place examined had crawled away from the treated plat.

This is one of the most satisfactory experiments I have ever made with kerosene emulsion. Mr. Cogan stated that he used a small portion of the emulsion diluted but eight times, and found that it did not injure the grass. However, there is no object in using it so strong, as it is easily applied, and we believe the very abundance of water helps to carry the kerosene into the soil. This was the purpose in having the ground treated so freely watered. Compared to our previous experiments for the destruction of white grubs (Bull. 13, Division Ent., 1887, p. 39) the results are similar up to a certain point, but where the earlier experiments ultimately resulted in failure we think the reason is to be found in the lack of facilities for drenching the soil. It would require a large quantity of the diluted emulsion to penetrate the soil to any depth. The emulsion was prepared according to the original formula published by this Division, and frequently repeated in Dr. Riley's official reports.

The following communication from Mr. Cogan may be taken as a thoroughly fair opinion of the success of the above experiments:

UNITED STATES CAPITOL GROUNDS,
Washington, D. C., August 2, 1888.

SIR: Early in the month of June I submitted to your Department specimens of grubs which I found destroying the grass on the lawns of the United States Capitol grounds.

Your assistant, Mr. Alwood, immediately investigated, and under his instructions the places affected were thoroughly drenched with an emulsion of kerosene in the proportion of one to sixteen, and the ground then well watered. I found that where this emulsion was used the grubs immediately ceased their depredations, penetrated

further into the ground, and not a live one was found to date after careful search, while in other places, where the emulsion was not used, they are still continuing their work in a lively manner. I have watched the experiment of destroying these grubs with a great deal of interest, for on its success or failure depended the preservation or destruction of the grass on the large lawn in front of the House of Representatives, and I have now much pleasure in stating that the experiment has been a great success.

Very truly, yours,

WM. J. COGAN,
Foreman.

Prof. C. V. RILEY.

EXTRACTS FROM CORRESPONDENCE.

A New Tomato Enemy in Georgia.

A year ago the accompanying Leaf-hopper was first noticed to be damaging young tomato plants. * * * I inclose you a few plants showing the nature of the damage, a single insect ruining a plant.—[A. Oemler, M. D., Wilmington Island, Ga., April 29, 1887.

REPLY.—The Leaf-hopper which you send is one which has not before been recorded as doing any such damage. It is Say's *Stictocephala festina.* Can you give us further details as to the numbers and the damage done, and their method of work, and also as to whether they appear to confine themselves to tomato plants? I can suggest nothing in the way of a remedy, except the kerosene emulsion spray.—[April 30, 1887.]

SECOND LETTER.—I inclose to you the young tomato plants to demonstrate the manner of working of the Leaf-hopper better than I could describe it. A single insect will ring the stem, when the lower stem may dwindle. The number is not great at present, still the damage is considerable on young plants, because it is not readily noticeable. It has not been seen on other plants. If you have overlooked the injury to the plants you may still observe it unless they have been thrown away. The outer bark does not seem to be eaten away, but a ring seems to have been sucked, injuring the stability, or I may say, continuity of the stem. A remedy seems inapplicable.—[May 7, 1887.]

REPLY.— * * * I have already noticed the peculiar ringing of the stem which you mention. This will be, as you say, a very difficult insect to fight, and I am at a loss at this distance to suggest a remedy. Perhaps on the ground you may be able to find one, in which case I hope you will not fail to forward an account.—[May 9, 1887.]

Precursors of Brood V of the Periodical Cicada, 1871-1888.

On June 6 I heard the note of the *Cicada septendicem* at Port Byron Junction, 4 miles east of Moline. I have heard the note every day since in Moline. They are here in such small numbers that they have not attracted general attention. Upon reference to your report of 1885 I conclude they are precursors of Brood V.—[Jerome McNeill, Moline, Ill. June 13, 1887.

REPLY.— * * * I am glad to receive your information concerning the note of the Cicada. I agree with you that these individuals must be precursors of Brood V, as there are no recorded broods for this year. Can you not obtain a few specimens?—[June 16, 1887.]

Mites infesting an old Grain Elevator.

* * * I send you some vermin that I have been watching with interest for some time, but which I know nothing of in a scientific way. If you can tell me anything of them you will greatly oblige myself and a friend who is the unfortunate owner of the souls and bodies of millions of them. They appeared about six weeks ago, though they may have been there for some time without having been discovered, in a grain elevator (a very old building which had stood vacant for years up to last May) in a bin containing about 5,000 bushels of best lake shore wheat. They then were like fine dust, almost microscopic, white and soft. There were none of the hard, brown kind among them nor any of the long, dark headed ones. They have appeared since.

These insects are found only in this one elevator and in the one bin. They are very numerous, sifting through the wheat and the spout so that one can sweep up a quart every morning from the floor below. The wheat is freed from them by being passed through a fan before shipping. * * *.—[Howland Russel, 420 Milwaukee street, Milwaukee, Wis., September 1, 1885.

REPLY.—* * * The "vermin" which infest the grain elevator are mites (*Acarina*). There were four species sent. The one which was the original infestor and which occurs in the greatest number is *Tyroglyphus longior*. The other species all prey on this one. One of them, a species of *Gamasus*, is very abundant, while the other two species (*Cheyletus eruditua* and *Eupalus* sp) seem to be rare. The *Gamasus* will probably in a short time destroy a great majority of the *Tyroglyphi*, and thus the pest of vermin will correct itself. It will be very difficult to cleanse the elevator without emptying it pretty well. I would advise the burning of sulphur all through the building, especially where mites abound, and, where they are particularly thick, it might be well to let a little bi-sulphide of carbon evaporate, remembering that this vapor is heavier than air and that it is exceedingly inflammable. * * *.—[September 4, 1885.]

SECOND LETTER.— * * * As you say, the parasitic mites have largely destroyed the smaller ones, and I suppose when their food is all gone they will die of starvation. I do not want to trouble you further, but if you know, will you tell me whether the *Tyroglyphus* is a mite that affects the wheat alone and lives upon it exclusively, or whether it is due to the aged condition of the wood-work of the elevator, and is likely to infest anything stored there?—[Sept. 9, 1885.]

SECOND REPLY.— * * * I am glad that the predaceous mites seem to be successful in their war of extermination, but it is not at all likely that they will permanently rid the elevator of the *Tyroglyphi*. If the wood-work of the elevator is old and there is much moisture about it, only the most radical measures will rid it of mites, now that they have established such a foot-hold. The contents should be removed as far as possible and the building thoroughly dried, and it should also be fumigated, as I suggested in my last. It should be repainted if possible, and all dirt and trash cleaned up. This course will be expensive, and it is for the owner to decide whether it will pay him to go to this trouble; but as I said before, it will be the only complete and satisfactory way. *T. longior* feeds on flour, hams, cheese, and a variety of other food products.—[Sept. 12, 1885.]

The Streaked Cottonwood Leaf-beetle in the East.

I send to you by mail to-day a box containing a beetle and larvæ which, we find, as a nuisance, is a fair rival to the potato-bug.

It gets on the young leaves and shoots of the Carolina Poplar, eating the leaves entirely off, and oftentimes destroying the bud on the end of the branches.

We first noticed it about three years ago, but as there were so few of them we did not take pains to destroy them, but they have been getting worse every year, until

now we are afraid they will do too much damage, and we are at work putting Paris green on the trees to see if that will kill them. * * * They are also spreading to the willows, and also to the young Kilmarnock willows and New American.—[Thomas B. Meehan, Germantown, Pa., July 6, 1887.

Reply.— * * * The insect which you find on the leaves and shoots of your Carolina poplars is the common Streaked Cottonwood Leaf-beetle (*Lina scripta*). This insect was described by Professor Riley in his Annual Report for 1884, on pages 336 to 340. The article was suggested by the great damage done by this insect in the newly-planted timber claims of the Northwestern Territories during the summer of 1884. The question of remedies is discussed in this article also.—[July 8, 1887.

Hibernation of Mosquitoes.

[The following letter was the second from Mr. Wade on this subject. His first letter mentioned incidentally that mosquitoes wintered in large numbers in his cellar, and the following is in reply to our request for specimens.]

I tried to catch some of the mosquitoes by day-light, but they were too wide-awake; so I let it go until this evening, when I tried to catch and box them alive, but it seemed as though two flew out every time I put one in. I have got a few for you, probably enough ; if not, I will try again. The cellar is very cold, and yet in one corner is a tin furnace conductor of heat. It seems as though they avoid the warm corner, as they were thickest all the time in the coldest part of the cellar. They seem nearly as lively as in the summer, and I notice they are paler in color than those outside in the open air. A few weeks ago they were so thick (in this cellar, of course), that my housekeeper would hold the lamp up to them, and in a very short time the inside of the chimney would be a half-inch deep or more. I gave John Butterworth, an English microscopist, now travelling here, a small bottle full of them to take home. To-day, though cold, I could look out of any of my windows and see them flying as in summer. It is many weeks since any of us were bit. I have never known them so bad anywhere as they were here the past summer, and yet it is high, dry, rocky ground.—[Jos. M. Wade, 158 Federal street, Boston, Mass., Nov. 16, 1884.

Reply.—I have carefully examined the mosquitoes you sent with your favor of the 16th instant, and I find them in no way different from one of our common and widely-distributed species which is supposed to be the *Culex ciliatus* of Fabricius. You are no doubt aware that, so far as we know, our northern mosquitoes pass the winter in the imago state and that, like most other insects, they choose places of a uniform and pretty low temperature. Thus they pass the winter in a semi-torpid condition without taking food, whereas in a warmer place they would be kept alive and perish for want of nourishment.

The fact that you found such immense numbers of mosquitoes in your cellar shows that they must have been unusually numerous with you the last season, and further that your cellar must have been particularly attractive to them as a suitable place for hibernation. Still, upon careful inspection of the locality in question, it ought not to be difficult to ascertain the reason for this remarkable gathering of mosquitoes as related by you.—[November 24, 1884.]

Leaf Hoppers and the "Die-back" of the Orange.

On yesterday I sent you by mail a bug, like inclosed, asking that I might be informed of its name and habits. To-day I send two more with samples of orange twigs in the grove where these bugs are in considerable numbers. I can't, for a fact, say the bugs are the cause of die-back, but certainly the presumption is great. They are constantly on the trees in considerable numbers; they do not seek roots or trees with scale on or any form of insect or fungus. They are on the new twigs or the growth prior to the last, and, as you will observe, the damage is to those parts of the

tree. The trees chiefly affected are set in grove budded last fall, dormant and cut off this spring. They have made a beautiful growth; are thrifty, clean, free from insects of every kind. The theory of soil-poisoning is hard to accept for the reason that every tree is not affected nd some older trees are not affected—only now and then one with here and there a twig—also the fact that the disease occurs in widely separated parts of the grove; and this morning I found one or two young trees in my nursery and some two or three trees in an entirely different part of the 40-acre property. Chiefly it occurs in places where cow-peas are growing, though the nursery is of course clean, but wherever the disease does occur these bugs are found. The habits of the bug, so far as the orange tree is concerned, are as follows: Usually they are in company, two or more; they rest on the twig, close to it, without motion for a long time. I stood watching six of them this morning for thirty minutes; they did not move until I disturbed them, but they protruded the termination of the abdomen beyond the wings and ejected with considerable force towards me minute drops of fluid in a continuous spray, an astounding amount of fluid for so small a bug. It wet the leaf that I inclose so that it ran down in a stream to the center and then dried on. I disturbed them, however, and could see no marks of any injury done by them. I found two "Green Soldier Bugs" and two or three "Leaf-legged Bugs," but surely that is nothing to an amount of damage being done. * * * —[C. F. A. Bielby, De Land, Fla., August 1, 1887.

REPLY.— * * * The insect in question is one of the Leaf-hoppers and seems to be a new species of the genus *Aulacizes*. Nothing definite can be said as to the work of the insect; that is a point which you will have to determine by observation in your grove. It is quite possible that they do a certain proportion of the damage, in which case the ordinary kerosene emulsion spray, applied for Bark-lice, will doubtless rid your trees of these also. Certainly the twigs sent by you through the editor of the Florida Dispatch were affected by the so-called "die-back" disease which has been frequently treated in the columns of the Dispatch, and which is mentioned by Mr. Hubbard in his Report on Insects affecting the Orange, and of which you doubtless have a copy.

Your observation to the effect that the *Aulacizes* occurs chiefly in places where cow-peas are growing may be an important one. Is the bug found upon the cow-peas also? The liquid ejected from the bug which you watched is of a saccharine nature, like honey-dew. Allied species are well know to eject this fluid with considerable force. The *Proconia*, which is found upon cotton-plants, is remarkable for the distance to which it ejects drops of the liquid. * * * —[August 6, 1887.]

SECOND LETTER.—In accordance with your request for additional specimens of the bug described by you as a new species of the genus *Aulacizes* I herewith send you tin box containing several of different ages and stages of development. I don't know how many there are in the box, as I caught them this morning with considerable difficulty.

There was a strong northeast, damp wind blowing, and whether that made them more lively or myself less so I am unable to say; they are quick in motion, strong in flight, and very wary. I have discovered the young down to a very minute size, but I can not as yet say as to their eggs, what they are like, or when deposited. I have not seen them on the cow-pea, but my observation leads me to think they are more numerous when this crop is grown in the grove. I judge from the yellow contents of the food-sac that they suck the essential oil from the twig. Would this affect the twig seriously? They choose a position head downward on a twig, not the nearest, but half (or less) hardened. When they are comfortably settled they straighten out the sucking tube, which, as you know, is short, then with their feet draw themselves down, with one motion, forcing the tube into the twig; they then remain perfectly passive. Whether they eject the fluid when not disturbed or not I can't say; but when I came near to them, not disturbing them, they ejected it in my direction; it is colorless, and leaves, on drying, a whitish deposit on the leaf (I send you herewith two leaves); it

may be "honey-dew," but it does not attract, so far as I have seen, ants or other in sects that are wont to gather to this sort of feast.

As to the result to the trees, the twigs I sent to the editor of the Florida Dispatch certainly had the "die-back;" that goes without saying, for they died back. I would like very much to connect this new marauder with the trouble, if possible. There is only one objection, or rather difficulty, but that seems almost insurmountable. I see the bug on plenty of twigs that do not die back, that absolutely decline to be in the least affected. I console myself with the reflection that they have oil to spare.

As a rule, however, the twigs do not die back unless they are very young; they blister and do not look well, but continue to harden and send out, some of them, new and healthy-looking shoots; others send out weak shoots that are sometimes themselves affected, *sometimes not*, usually the twig reddens a little, but not always. There is on reasonable hypothesis upon which to base the trouble except insects. I sunk a shaft 10 feet in the ground between four affected trees. Two feet of gray sand (first class), then 8 feet of yellow sand. After 6 feet down there were three or four thin strata of red sand, one-fourth to one-half inch in thickness. At 10 feet struck water. Drove a rod down 9 feet further and found no hard pan. The soil is of the best pine land. The original growth was very large, soft pine trees and willow oak as large as my body (and that is good size).

As to other bugs, there are a few leaf-footed bugs; also a few *Euthoctha galeator;* these I have never seen doing any great damage. There are a great many of the Green Soldier Bugs. I don't see them doing much sucking at twigs, though I have seen some. But the trouble in my grove seems to be the same or nearly so as that described by Mr. James Franklin (Hubbard, page 160). In conclusion, permit me to say that the same twig blistering and dying is not confined to my grove; I find it in quite a number of groves, but in none so general as my own. In not less than four or five young groves, in different places, there are the new bugs, and there also are the diseased twigs. So also in groves where the twigs are not diseased, the bugs occur; and in groves where are both twigs and bugs, some trees have every twig affected and other trees have no signs. So what would be a clincher against the bugs is really turned to our confusion.—[August 10, 1887.]

SECOND REPLY. * * * The specimens which you sent comprise not only the new species of Aulacizes which accompanied your previous letter, but two specimens of *Proconia undata*, a closely allied species, and also a number of young of one or the other. * * * It will be impossible to connect either of these leaf-hoppers or any of the Soldier Bugs with the diseased condition of your trees. Their punctures, of course, help to weaken the vitality of the trees, but that they are the cause of the "Die back," is hardly possible. You have doubtless read what Mr. Hubbard says in his report on orange insects concerning the "Die back," and this comprises the extent of our present knowledge of this trouble.

The mycologist of the Department is making studies of the fungi connected with the disease of the orange, and it is possible that some practical results may be obtained through his investigations. For the present we can only recommend the dilute carbolic or creosote washes. A few more specimens of the Aulacizes will be acceptable, and you might, if you feel so inclined, send on a few specimens of the insect which you know as the "Green Soldier Bug."—[August 16, 1887.]

The Barnacle Scale Injuring Persimmon.

You will find inclosed two twigs cut from a persimmon covered with what I suppose to be a kind of scale. I have seen now and then one on an orange tree, and have always destroyed them for fear that it might be the Fluted Scale (*Icerya purchasi*). This persimmon tree was covered with them, and I burned it up. It is the first time I have seen them in any numbers. * * * [W. A. Marsh, Orlando, Orange County, Fla., August 15, 1887.

REPLY.—The insect upon the twigs is the common Barnacle Scale of Florida. (*Ceroplastes cirripediformis* Comst.) It is figured and described in the Annual Report of this Department for 1880, and in Hubbard's Report on Insects Affecting the Orange. Its occurrence upon Persimmon has, I believe, never been publicly noticed. It is usually found upon the species of *Eupatorium*, and occasionally upon Orange and Quince. It is not a very common insect, but if it should become numerous enough to threaten damage, it can be killed while young, before the wax is hard, by the application of the ordinary kerosene emulsion.—[August 19, 1887.]

Euryomia Melancholica vs. Cotton Bolls.

I send you by this mail a small box containing a specimen of damaged cotton-boll and the bug which my correspondent thinks is the culprit. It comes from Mr. C. H. Estes, Talbotton, Ga., who writes me that he took them from the farm of his neighbor, Mr. H. C. Greene, and that as many as 39 bolls similar to the one sent were taken from one stalk of cotton. I have written to Mr. Estes, expressing doubts about the truth of his theory. It does not appear to me that the injury was done by the beetle. However, I know but little about such things, and know that new insect depredations are being developed constantly. Please give me your views or the history of the bug.—[J. T. Henderson, Atlanta, Ga., August 21, 1885.

REPLY. * * * The insect is a beetle which is very common throughout the South. It has been called the Melancholy Euryomia (*Euryomia melancholica*). It is a very general feeder, and occasionally damages peaches and other fruit, but seems to prefer such fruit as is rotting and has been previously gnawed into by some other insect. It is also found clustering about bruised and cut places in the trunks of trees from which the sap is exuding. Your surmise was therefore correct, and an examination of the boll sent seems to indicate prior damage by the boll-worm.—[August 26, 1885.]

A Peach Fruit-worm in Japan.

During my stay in Japan as naturalist of the United States Eclipse Expedition my attention has been attracted to the general prevalence of disease among fruit trees of a deciduous growth, due for the most part to the ravages of insects. My attention has been especially attracted to the fact that the peach crop is rendered an almost complete failure, so far at least as the quality of the fruit is concerned, by the attacks of a small lepidopterous larva which bores the fruit, causes it to decay, prevents its coming to a sound maturity and ripening in a marketable condition. In consequence of this liability to insect attacks, the custom prevails almost universally, as you are well aware, of taking the fruit from the trees while yet green and hard and thus exposing it for sale and consumption.

I desire to suggest, inasmuch as large exports of trees and plants to the United States are constantly taking place from the Japanese ports, that wise precautions should be adopted to prevent the accidental introduction into the United States of this pernicious insect, which so far as I know has not yet made its appearance upon our soil. While it is barely possible that the climatic condition in the United States might prove unfavorable to its development and propagation, this is altogether unlikely. There should be, in my judgment, steps taken to absolutely prohibit the transportation to the United States of Japanese peach trees, or of trees and plants which have been grown or packed in soil taken from the vicinity of peach trees and peach orchards, inasmuch as the larva of this insect undoubtedly pupates in the soil or upon its surface. For the sake of the farmers and fruit-growers of Japan I would like to suggest that if no entomologist has hitherto worked out the life history of this insect and ascertained the best means of combating its attacks, it would be desirable that the Japanese department of agriculture should take the matter into hand and have the work done. I would like to suggest as a useful precaution the destruction of all badly in-

fected trees, especially seedlings growing by the wayside and in waste places, and the careful collection of all wind-fallen and diseased fruit and its destruction by fire. The consumption of fruit in an unripe condition can not be otherwise than prejudicial to the general health of the community, especially in seasons when cholera and like diseases are prevalent, and the financial loss to the agriculturist must be immense when we bear in min l that the ravages of the codling-moth which attacks the apple in the United States are estimated to annually occasion a loss to the fruit-growers of the Union of from $4,000,000 to $5,000,000; the importance of checking the attacks of a similar insect infesting the peach in Japan must commend itself to your mind. Our own Department of Agriculture at Washington has labored long and laboriously to instruct the fruit-growers of the United States as to the best and most effective means of guarding against the ravages of such insects, and it can not but feel that the Japanese authorities have a work to do here which, if accomplished, would be a great benefit to their farming community.—[W. G. Hall, Ph. D., naturalist, United States Eclipse Expedition to Japan, Tokio, Japan, September 15, 1887.

[The above letter was written by Dr. Hall to Hon. R. B. Hubbard, United States minister to Japan, and by the latter was referred to this Department through the Department of State. Commissioner Colman's reply follows. We have since received no further information on the subject.]

I have the honor to acknowledge the receipt of your letter of the 26th instant, inclosing Dispatch No. 379 from Mr. Richard B. Hubbard, United States minister at Tokio, which is accompanied in turn by a letter from Mr. W. J. Holland, the naturalist of the United States Eclipse Expedition to Japan. The matter has been referred to the acting entomologist of this Department, who reports that the subject is one of considerable interest, but that its full weight can not be determined without a more accurate idea of the nature of the insect in question. If it should prove to be one of the insects which already infests the peach in the United States any regulations to prevent importation will of course be unnecessary. It is desirable, therefore, that some entomologist in Japan should investigate the matter and determine accurately and specifically the identity of the pest in question. Prof. C. Sasaki, of the Agricultural and Dendrological College, Tokio, Japan, is a very competent individual, who has made his name well known by his investigations of the Uji parasite of the silkworm of commerce.

If your Department will kindly forward this letter to Mr. Hubbard, with the request that he will forward it to Professor Sasaki, requesting him to correspond direct with this Department, we shall be able to get to the bottom of the matter in the shortest possible time. Mr. Holland himself should also be requested to rear the insect and send it in all its stages to this Department.

Hibernation of the Two-spotted Lady-bird.

I have observed some little matters the past three winters in my present house that may or may not interest you. During those winters there has seldom been more than two or three days passed that I have not had "lady-bugs" creeping and flying about my house. My library is never warmed except in the evenings, but when the room got warm they would invariably come out and be active all the evening, seldom more than one or two at a time, but they have shown themselves continually every few days during that time. At one time during cold weather there were probably 1,000 on the inside of my front door. I have fed them milk, beer, water, and made one drunk on gin; yes, it was actually drunk and showed it; they drink readily; after being about my desk for a few days.—[Jos. M. Wade, Boston, Mass., March 31, 1885.

REPLY.—* * * The species you refer to is no doubt the Two-spotted Lady-bird (*Coccinella bipunctata* Linn.), and as an interesting point in the natural history of this species I would state that of the many species of Lady-birds so abundant in summer-time almost everywhere, this is the only one which has accustomed itself to

seek winter quarters in our houses. Of course specimens may also be found occasionally hibernating under bark or other suitable places out-doors. * * *—[April 3, 1885.]

Prior Issuing of the Male Sex of Cimbex.

* * * Let me add that I was greatly interested in your account of *Cimbex americana*. Some seven or eight years ago I had about a pint of the cocoons, obtained from between the roots of the weeping willow above ground and among the leaves on the ground. There were more there; I raised them. Think I got nearly 200 imagos, and was surprised that, with the exception of two or three individuals, the first 80 that came out were males. I used a large empty aquarium for the hatchery, and the show made was fine.—[Sam'l Lockwood, Freehold, N. J., March 31, 1885.

Work of the Bronzy Cut-worm in Missouri.

I mail you, simultaneously with this, box containing the larva of some insect (probably) that has at this date denuded the Timothy grass of its seed, holds it like a coon in its fore feet while it eats and then drops the empty shell. It has now stripped nearly every head in our extensive meadows. I find this morning a small, quick-flying miller in the grass which I can not catch and do not know as it is related to these worms. Please determine its species and give us its life-history if you can.—[A. D. Thomas, Terre Haute, Palmyra County, Mo., June 24, 1887.

REPLY.— * * * The worms which you sent belong to the species known commonly as the Bronzy Cut-worm (*Nephelodes violans*). This is a species which has seldom been recorded as doing much damage. It was noticed by Professor Riley in 1871 in Missouri, and in 1881 it did considerable damage in northern New York. It is a very widespread species, and is found in all of the United States east of the Rocky Mountains. The worm does most of its damage in May and June, and enters the ground to transform to pupa towards the middle or the latter part of June. It remains in this condition until autumn, when the moth makes its appearance. Where a field has been badly damaged it will be a good plan to plow it over in July or August and expose the pupa to the heat of the sun and to flocks of chickens and turkeys. This is the only remedy which is like to prove efficacious.—[July 19, 1887.]

The Bamboo Sinoxylon.

Inclosed in glass bottle you will find some curious beetles which were found boring into and apparently living upon an ornamental bamboo box placed on a table in one of the rooms; no indication of their presence was noticed until on lifting the lid the fine powder from their borings was seen, and on a slight shake numbers of the creatures were dislodged and moving about quickly. Under a magnifying glass their curious figures are quite interesting to watch. Any information you may see fit to forward will be awaited with interest.—[A. L. Townsend, box 246, New York, N. Y., January 8, 1888.

REPLY.—Your letter of the 8th instant, inclosing specimens of insects found boring into an ornamental bamboo box, has been duly received. The insect in question is one of the wood-boring beetles of the genus *Sinoxylon* and belongs to a species which, although undetermined is frequently found in bamboo canes and boxes from China and East India. It is closely allied to a species found in Florida and it has similar habits. These insects are slow of development and indeed may remain in a state of retarded development for a number of years. If you wish to completely disinfect your box you can do so by pouring upon it a little bisulphide of carbon.—[January 16, 1888.]

The Western Cricket in 1887.

I hear that "grasshopper locusts" have been very destructive this year in the Greenhorn district, on the border of Pueblo and Huergano Counties, but I have not

been able to visit the district or obtain any specimens of the destructive species. I expect, however, that they are the *Camnula pellucida* (*C. atrox*), as this species appears to be abundant this year in Colorado. I found it particularly abundant at the head of the Arkansas River, in Fremont Pass, and also in the streets of Leadville, both these localities being on the eastern slope.—[Theo. D. A. Cockerell, West Cliff, Custer County, Colo., December 1, 1887.

[See Second Report U. S. Entomological Commission.]

Dicerca a Poplar-feeder.

A few weeks ago I discovered a Coleopterous larva, 15½ millimeters long, boring into a *Populus tremuloides* tree. I put it into spirits for future investigation, and thought no more about it until I came across the figure of larva of *Dicerca divaricata* (Third Report U. S. Ent. Com., Pl. VI, Fig. 2), and noticing the resemblance to my larva, took out the latter for comparison. There can be *no doubt*, I think, that my larva is a *Dicerca*—probably *D. prolongata* Lec. (vide former letter), thus fully confirming this as a poplar (and not pine) feeder, and establishing it as a decidedly injurious insect. To me personally, however, it is a beneficial insect, since it kills just enough trees in this neighborhood to keep me supplied with dry fire-wood.—[T. D. A. Cockerell, West Cliff, Colo., December 27, 1887.

An Enemy to Young Carp.

I inclose two insects—No. 1, the larger, sent to me by a gentleman who states that it fastens on the carp fish and finally kills it. * * *—[W. L. Jones, Atlanta, Ga., October 3, 1884.

REPLY.— * * * The specimen, No. 1, which is reported to have attacked and killed a carp, is the larva of one of our common Dragon Flies or Mosquito Hawks (Family Libellulidæ, Order Neuroptera), the species having been described as *Anax junius*. These larvæ are aquatic, and feed upon all sorts of soft-bodied water insects they can get hold of. They are also known to attack young fish, but this is a rare occurrence, since the larvæ are slow-moving animals and by no means able to pursue a fish.—[October 7, 1884.]

NOTES.

THE TWELVE-SPOTTED DIABROTICA INJURING FRUIT TREES.

A new habit of this destructive species was brought to our attention the present spring. Mr. J. Luther Bowers, who resides at Herndon, Va., has a young orchard consisting of trees planted for the most part in the spring of 1887. The neighboring fields are partly cultivated and partly grass lands, with no forests near. Most of the field in which the orchard stands was in corn last year and is entirely so planted this year. Last year, however, there was a half acre of melons on the south side. The trees made a fine growth last year and are now vigorous and promising except where the leaves have been eaten. The orchard consists of rather more than 2,500 trees, of which 760 are plums, and the rest are peach, pear, cherry, apple, and apricot. The varieties are mingled together, the apples, however, being set out to form a permanent orchard. In the latter part of April and the first of May, when the leaves were putting forth, Mr. Bowers observed the beetles of the Twelve-

spotted Diabrotica eating the leaves. The plums and the apricots were selected out by the beetles, and except in a few instances nothing else was touched. The exceptions were the Governor Wood Cherry and the Hansell Raspberry, which were slightly injured. The attack began upon trees planted in the old melon patch above mentioned. The plums and apricots in the immediate neighborhood were soon stripped of foliage, and the insects spread over nearly the entire orchard. The first and second growth of leaves were almost entirely devoured and the third growth was much injured. Many of the trees partly succumbed to the attack and some were killed entirely. The injury was quite severe and amounted to several hundred dollars. The injury was not entirely due to the Diabrotica, although Mr. Bowers, who is a very good observer, states that this insect was by far the most numerous of any of the species found upon his trees. The well-known weevil—*Epicærus imbricatus*—occurred in small numbers and attacked the foliage to some slight extent, and one of the common May beetles—probably *Lachnosterna fusca*—was also present on some few evenings in still smaller numbers. Another Scarabæid (*Diplotaxis* sp.) was also noticed. There seems, however, no doubt but that the main damage was done by the Diabrotica, and this instance is certainly the most marked which has ever been brought to our attention of damage done to fruit-trees by this species. It is safe to say, however, that this occurrence is exceptional, and that it depended almost entirely upon the peculiar circumstance of a young orchard having been planted close to a last year's melon patch, which was not replanted this year. The beetles undoubtedly bred upon the melons last season and hibernated in large numbers. The present spring, finding no more appropriate food at hand they took to the young plums and apricots merely as a substitute. We have little fear, therefore, that a new habit has been formed.

The above facts are gathered from correspondence with Mr. Bowers and from observations made by Mr. Alwood, who visited Herndon at our direction on the evening of June 13th.

HEAT EVOLVED FROM THE WORK OF A BRUCHUS.

In June, 1887, Judge Lawrence Johnson, of the U. S. Geological Survey, a member of the Entomological Society of Washington, sent to the Division from Holly Springs, Miss., a small quantity of Cow Peas (*Dolichos* spp.), which were badly infected by *Bruchus scutellaris*, and in his accompanying note mentioned a circumstance which is worthy of record, as we do not recollect to have seen anything similar in print. The peas when he first examined them were contained in a paper sack, which would hold about one gallon, and which was about one-third full. Resting the bottom of the sack accidentally upon his hand he noticed that it was very perceptibly warm. He then tested its heat with an ordinary thermometer and found that while the temperature of the air was

only 71° Fahr., the mercury rose when placed among the peas to 96° Fahr., a difference of 25° "in a few minutes."

This difference in temperature was evidently due in great part to a mechanical cause, the gnawing of the peas by the beetles and larvæ, for subsequent tests have shown that the difference in temperature between uninfested peas in mass and the surrounding air in summer is slight, varying with the time of day, the peas being cooler than the air at midday and warmer after sundown. No opportunity has since offered for testing the temperature of the weevils alone in mass, although such comparative tests would be interesting.—L. O. H.

ECONOMIC ENTOMOLOGY IN INDIA.

We are indebted to Mr. E. C. Cotes, first assistant to the director of the Indian Museum at Calcutta, for copies of his first and second papers upon economic entomology. No. 1 is devoted to a preliminary account of the wheat and rice weevil in India, and No. 2 considers the experimental introduction of insecticides into India, with a short account of modern insecticides and methods of applying them. Of the latter we need not say anything, except that it is a short summary of a few of the remedies now in use in this country. The first, however, is of considerable interest as a consideration of the cosmopolitan *Calandra oryzæ* in a more or less tropical country in which the principal industries are wheat and rice. Mr. Cotes has gone over the ground of previous publications very carefully and introduces a great deal of interesting correspondence. Nothing new in the way of remedies is suggested and no particular experiments have apparently been made. The point in his paper which interests us most is the statement of the loss which is brought about. He says: "The amount of loss occasioned by the weevil is estimated by Messrs. Ralli Brothers at an average of 2½ per cent., the maximum being 5 per cent. and the minimum 1 per cent. Taking the value of the wheat exported at £6,000,000, the annual loss occasioned by the weevil in exported wheat alone is £150,000. This sum, however, in reality represents but a fraction of the whole loss, as it does not take into account the damage done to wheat consumed in the country or any of the loss occasioned to the rice, which is also attacked by the same weevil, besides the loss indirectly occasioned owing to the difficulty of storing the grain." The species seems to be two-brooded in India, the beetles appearing in June and January.

BUFFALO-GNATS ATTACKING MAN.

In our report for 1886 we devoted a paragraph to the consideration of several cases of loss of human life from the bites of Buffalo-gnats, but our agents who have visited the region where these insects abound find that rumors of such cases are hard to trace and that the newspaper reports are seldom authentic. All of the agents employed on this investigation have been asked to verify if possible any such accounts, and

the following quotation is from a letter received by Mr. Webster in reply to inquiries which he had made:

"I had a nephew by the name of L. H. Stokes; I suppose he was thirty-five or forty years old and a man of family. He lived near the Hatchie River—I think it was near Hening Station; the year I have forgotten, but think it was about 5 or 6 years since. It seems from what I could learn that Stokes, in company with a party, went fishing and crossed over onto an island. The gnats were bad, and the party kept leaving. All were scattered on the island. Finally, in leaving, it seems they left my nephew over there. It rained and put out the fire (it was cold and the smoke was some protection from the gnats); he had no matches, so he went to where they left the boat, and found his company had all gone and taken away the boat. He could not swim, so he was left to the mercy of the gnats. He fought till near night before he could make any one hear him. After they came and took him over he went home and suffered considerably, and before day he died. I never learned the doctor's name, as my sister objected to the marriage of her son, which caused a coolness, so he moved off, and we did not know it until several days after his death. This is all I can tell you about it. There is no doubt but that the Buffalo-gnats killed him. I learn that he was very much swollen. He has a brother living near Chestnut Bluff named Clinton Stokes, but I do not think he could give you any information. You ask what part of the body was bitten. I can not tell this, but think it was his hands, arms, face, neck, etc.—A. E. Buck.

NEW EUROPEAN NATURAL ENEMIES OF THE ASPARAGUS BEETLE.

H. Lucas, in the Annales de la Société Entomologique de France, 1st part for 1888, just published, announces that he has discovered two new natural enemies of *Crioceris asparagi* in the vicinity of Huppain. One is the Heteropter *Calocoris chenopodii*, which he discovered in the act of sucking a larva, while the other is of much more importance and is nothing less than an internal Tachinid parasite, viz, *Myobia pumila*. This species has long been known in Europe and was first described by Macquart in 1854. Mr. Lucas observed these flies abundantly throughout the asparagus beds, but did not suspect that they were parasites of the larva of the Asparagus Beetle. While searching, however, for the pupa of the *Crioceris* he found in the earth under the young plants a large number of larval skins, which had near the head, and sometimes also at the other end of the body, large openings. He took a dozen full-grown larvæ and placed them in a box (this was in July, 1887), and upon his return to Paris, about the middle of August, he found that several of the Tachinid flies had emerged, having undergone their transformation to pupa and to fly within the skin of the *Crioceris* larvæ. From observations which he made it seems that the fly frequently emerges from the larva before the latter has descended to the ground.

No one seems to have noticed this habit of the *Myobia* before, and, judging from Mr. Lucas's experience, it seems to have been so common in the locality where he observed it as to be an important factor in regulating the numbers of the Asparagus Beetle. Up to the present time not a single natural enemy of this insect has been discovered in America, although it is annually doing a great deal of damage from Long Island to Virginia and for some little distance inland. It ought not to be a difficult thing at the proper season of the year to import this parasite from France, and we shall be greatly pleased if our friend, M. Lucas, will assist us by sending material. No species of *Myobia* are now known in this country.

CONCERNING THE UJI PARASITE OF THE SILK-WORM.

Prof. C. Sasaki's admirable paper upon the biology of the celebrated silk-worm parasite of Japan has already been noticed in this country in a recent number of the American Naturalist, and hence does not require further notice here. We may state, however, that we have received specimens of the parasite from Professor Sasaki direct. Our object in mentioning the paper at this time is to call attention to the fact that Mr. J. M. F. Bigot, in the *Annales* for 1888 (Bulletin, page XXXIX) states that after a careful examination of the plate he has is decidedly of the opinion that Rondani's provisional erection of the genus *Ujimyia* for this species was unnecessary and that it really is nothing but a species of the Tachinid genus *Leskia* of Robineau-Desvoidy (1830). Mr. Bigot's determination of this fact is extremely interesting because from his standing as a dipterologist there can be but little doubt as to the accuracy of this conclusion and principally because there are two European species of the genus *Leskia*, viz, *L. aurea* and *L. bicolor*, and there will therefore be opportunity in Europe to verify the abnormal point in the life history of the Uji fly brought out by Mr. Sasaki, which is to the effect that the eggs are not laid upon the silk-worms, as is the custom with other Tachinids, but are laid upon the mulberry leaves and are hatched after they have been eaten by the silk-worms. We are not aware whether the habits of the European species are known, but if they are at all common it ought to be not a difficult matter to ascertain their habits and to compare them with those of *Leskia sericaria*, as the Uji fly must now be called.

Our faith in the unity of habit in the same family would make us somewhat skeptical of the accuracy of Sasaki's observations, notwithstanding the high character of the work as a whole.

Outlook for Locust or Grasshopper Injury.—One of the most important results of the Rocky Mountain Locust investigation by the U. S Entomological Commission is that, by visiting the chief breeding-grounds of the insect and noting the state of affairs there, it is possible to predict in advance, with a high degree of probability, whether or not there is any danger of extensive injury the ensuing year in the temporary region, or country occasionally invaded. Fully recognizing the economic importance of this, we have, since our connection with this Department, endeavored to have such observations made, whenever practicable, as would give us the required knowledge; and it is gratifying to know that the conclusions which we have hitherto ventured to draw from the reports have been so far uniformly justified by subsequent experience. Mr. Lawrence Bruner has just returned from a visit to northwestern Nebraska, southwestern Dakota, and central Wyoming, and has sent us a brief report of the results, which will be found in this number. It is with great pleasure, therefore, that we announce that, so far as this examination warrants an opinion, the outlook for the coming year is most favorable. We are all the more pleased to make this announcement because, from the accounts in the Ottertail region of Minnesota earlier in the season, and the excessive drought that has prevailed for two or three years in some portions of the West and Northwest, we had fears of serious injury in the near future.

While, therefore, the work of Mr. Lugger in Minnesota, and that of Mr. Bruner in other parts of the Northwest, show favorably for the immediate future, very considerable injury has been done by sedentary or non-migratory species in some parts of the country the present year. An account of very serious damage in Michigan from *Caloptenus bivittatus* and *C. femur-rubrum* appears in the "Extracts from Correspondence" in the present number.

We are much gratified at the manner in which "Insect Life" has been received, and with the many assurances from working entomologists of sympathy and support. We shall be glad to publish, from any

source, original contributions to knowledge of insect life, or communications that will in any way advance economic entomology. A prominent author and naturalist, and one deeply interested in the habits of insects, so nearly expresses our intentions and wishes in a recent letter that we quote the following passage therefrom:

May I be permitted also to express my gratification at the action of the Agricultural Bureau in making this new departure. In my judgment it is a highly important and valuable addition to the study of economical entomology, and indirectly will tend to stimulate all investigations into the habits of our insect fauna. I sincerely trust that this monthly bulletin will be a prominent feature of your Division, and that it will assume a broader character as it develops and become a national organ of all who are working in the field which it covers; that it will represent us before the entomologists of Europe, and will thus become what we have so long needed, a vehicle of communication between the more scientific workers and students and the masses of intelligent people, as well as an organ of interchange of facts and theories between entomologists themselves.

Importation of Insect Parasites.—It is rarely that such an excellent opportunity offers for practically exemplifying the benefit that may accrue from the artificial introduction of parasites of introduced insects that are injurious to agriculture as has lately been afforded by the history of that most destructive of Californian pests the Fluted Scale (*Icerya purchasi*). At our request and through the kind efforts of Mr. Frazer S. Crawford, of Adelaide, South Australia, the Dipterous parasite, described by Dr. Williston on page 21 of this journal, has been successfully introduced, but with what final results we shall indicate later on. The subject is, however, so important that we have long wished to have a thorough study made of the parasites of the Icerya in Australia, with a view to a systematic effort to introduce them alive. The Commissioner of Agriculture appealed to Congress for authorization to send an agent to Australia for such purpose, but without avail, as there has for some years been a clause in the bill appropriating for several of the divisions of the Department which confines investigations within the limits of the United States. We are glad to announce, however, that through the public spirit of the commissioners to the Melbourne Exposition, and of the Secretary of State, the Commissioner of Agriculture has been able to send an agent, and Mr. Albert Koebele sailed on the 23d of August under our instructions, from which we quote the following:

As you have already been informed, your mission to Australia is for the purpose of making an investigation of the parasites of *Icerya purchasi*, with a view of introducing them into California. It will be necessary for you to go to Adelaide to see Mr. Frazer S. Crawford, who sent the Dipterous parasites and the *Calostomas* (or rather *Monophlebus crawfordi*) to Mr. Klee and Mr. Coquillett at my request. This Dipterous parasite has been named by Dr. Williston *Lestophonus iceryæ*, and at Adelaide you will probably be able to study this insect carefully. Make the most careful investigations wherever you can learn of the occurrence of *Icerya*, and find as many of its natural enemies in Australia as possible. Find out also the periods at which these parasites oviposit, and ascertain the season at which success in importation will be

most likely with each and all of them. Once on the ground you can see for yourself just what will be necessary to be done in order to bring about this result. You should also endeavor to place the Department in correspondence with as many observers as you can interest in the subject, and should by all means endeavor to get at least one person who will be able to devote some time to the matter and to continue observations after you return. You will inquire immediately upon arriving in Melbourne concerning the largest orange-growing districts in Australia, and also make inquiries as to the best places for observing *Icerya*, aside from Adelaide. If you will visit the Botanic Gardens in Melbourne you will be able to get some information there. Baron Von Mueller, formerly director of the Botanic Garden, is still a resident of that city, and you will find him a very well-informed person to consult. I inclose letters of introduction both to Mr. Crawford and to Baron Von Mueller.

We shall hope for good results from Mr. Koebele's investigation, for we have no one connected with us who is more careful, capable, and persistent in field investigations.

New England Butterflies.—We are glad to learn from Mr. Scudder that his great work on New England Butterflies is now rapidly printing, and he hopes to get the first part out early in the autumn. From what we know of this publication and the great care and ability of the author, we anticipate the most thorough and creditable piece of entomological work ever published in this country.

NOTES ON THE ROCKY MOUNTAIN LOCUST.

West Point, Nebr.,
August 28, 1888.

Dear Sir: In accordance with your letter of instructions accompanying that of the honorable Commissioner of Agriculture, I left home on the 9th day of the present month for a short tour of the northwestern portion of this State and adjoining portions of Dakota and Wyoming, to examine into the subject of the Rocky Mountain Locust, so as to be able to report as to its future possible depredations; also to collect the various species of locusts to be met with at the different localities where halts were made.

I accordingly made the first halt at Valentine, near Fort Niobrara. Here, although it rained and was cloudy during the entire day, quite a number of very interesting locusts were captured. Among these but two specimens of the migratory species were found, although special search was made for that particular kind. Inquiry among the surrounding settlers and officers of the fort proved the almost entire absence of the pest for a considerable number of years.

At Chadron a second stop was made. Here, also, collections were made, with fair success; but not a specimen of *M. spretus* found or reported by the many persons interviewed. Here the "Bad Lands" fur-

nished a species of *Trimerotropis* which may be new, as did the grassy bluffs near Valentine one belonging to the genus *Mesops*.

The next halt was made at Buffalo Gap, Dak., where I took the stage for Hot Springs, a point 15 miles distant and much better situated for making collections in the *Acridinæ*. A portion of two days was spent here and some collections made, with the result of greatly extending the known range of a number of species. No new material was found.

From this latter place I hired a team, in company with a commercial man, to Custer. At this place much interesting material was taken, and Harney Peak, the highest point in the Black Hills, visited, upon the summit and upper slopes of which sub-alpine forms of *Melanoplus* and *Pezotettix* were taken. One of these, possibly two of them, may be new. A good series of all were obtained, notwithstanding the difficulty with which the mountain was climbed, the distance traveled, and the rain that fell during the day. The altitude of Harney Peak is just about 8,000 feet above sea-level. Collections were also made at about 5,000 feet elevation. At this latter elevation a species of *Arcyptera* was obtained that is new to me, possibly new to science.

Having visited the most interesting portions of the Black Hills region for the collection of Acridians, and not hearing of any locust depredations to the northward, it was decided not to visit Rapid City, but to return to Buffalo Gap via the Hot Springs. Just before starting I learned of the presence of the Army Worm (*Leucania unipuncta*), about three miles from Custer. The description was so perfect that the identity of the insect was sure. My informant claimed that but a single field of oats had been injured.

At Fort Robinson, Nebr., a second army-worm depredation was brought to my notice, this time receiving my personal attention. Here, as at Custer, but a single field of oats was injured, and if attended to, the pupæ, which had just formed, can mostly be destroyed, and prevent the possible greater injury next year.

Here collections were made in the family *Acrididæ*, but no new species added. Some of the western or Rocky Mountain species were found, thereby extending their hitherto known range considerably farther eastward.

At this point I was enabled to meet quite a number of Army officers and troops who had recently been over different portions of Wyoming, Colorado, and Utah, and from them learned that the Rocky Mountain locust is nowhere present in these parts in more than ordinary numbers. To be entirely satisfied as to the possible mistake of these different persons with whom I spoke on the subject, I went as far west as Douglas, Wyo., only to find *spretus* entirely absent there. Inquiries here also went to show that this pest is nowhere to be found within the region mentioned, nor had any damage been reported since several years ago. Here, also, some scattering injuries by the army-worm were

reported, but not in such numbers as those mentioned above. At one or two localities, viz, on Upper Powder River, and at a point about twenty-two miles west of Douglas, native hoppers of various kinds had done some little injury to gardens, but nothing further.

Finally, unless there should be swarms at present unknown to me in Montana, Northern Dakota, and the British Possessions to the north—and the swarms of Ottertail County, Minn., and neighborhood have been pretty well reduced—there is no danger of an invasion for several years to come.

Very respectfully, etc.,

LAWRENCE BRUNER,
Special Agent.

Prof. C. V. RILEY,
U. S. Entomologist, Washington, D. C.

INJURY DONE BY ROACHES TO THE FILES IN THE TREASURY AT WASHINGTON.

In consequence of the injury done to certain valuable documents on file at the Treasury Department by insects or mice, the following letter was written to the Department of Agriculture in May last:

TREASURY DEPARTMENT, OFFICE OF THE SECRETARY,
May 22, 1888.

SIR: The Secretary's files of this Department are being seriously injured by the ravages of insects or vermin, and with a view to the adoption of some means for their extermination, I shall esteem it a favor if you will authorize Prof. Charles V. Riley, or some equally competent officer, of your Department, to make an examination of the matter and recommend such measures as shall enable this office to protect its files and records from further mutilation.

Very respectfully, yours,

HUGH S. THOMPSON,
Acting Secretary.

Hon. NORMAN J. COLMAN,
Commissioner of Agriculture.

In answer to this, we sent Mr. Townsend with the following letter to the chief clerk of the Treasury Department:

U. S. DEPARTMENT OF AGRICULTURE, DIVISION OF ENTOMOLOGY,
May 23, 1888.

DEAR SIR: In accordance with instructions from the honorable Commissioner of Agriculture, given me at the request of Hon. Hugh S. Thompson, Acting Secretary of the Treasury, I send the bearer, Mr. Townsend, an assistant in this Division, to examine the rooms in which the damaged records are stored. Will you kindly allow Mr. Townsend every facility for this examination? Upon his report my recommendation will be based.

Yours, respectfully,

C. V. RILEY,
Entomologist.

Mr. E. B. YOUMANS,
Chief Clerk, Treasury Department.

Accordingly Mr. Townsend visited the Treasury May 23, 1888, and was shown every attention by Mr. Youmans, who in person took him all through the building, and assisted him in making the following observations:

PERIPLANETA AMERICANA.

The basement was first visited and many books examined which had the entire backs eaten off. These were old as well as more recently bound books and were on shelves away from the floor, all being in as dry and favorable situations as are to be found in the basement. No specimens were found at work. Those found had been killed by the insect powder which had been applied all over and around the records the afternoon before, and were lying on their backs. They were the large native species only, *Periplaneta americana*, there being none of *Ectobia germanica*, the smaller common roach (called also "Croton Bug" and "Water Bug"). No live roaches had been noticed that day, not having up to that time re-appeared. All those that had been covered with the powder had died. A large number of copies of the "Senate Report upon Methods of Business in the Executive Departments," which had just been bound (printed March 8, 1888), and were piled up from the floor, were half of them eaten into in patches over the backs and covers outside, presenting a corroded appearance. These reports are sparingly sent out on account of their value and importance. A specimen set, showing the injuries by the roaches, will be sent to this Division. These books were bound in black cloth and had been eaten into for the paste with which the cloth was put on the covers. It was for the same reason that the backs of the other older, leather-bound books had been eaten away. Specimens of excrement found on the shelves near these books no doubt belong to *P. americana*, and the places eaten had similar excrementitious spots upon them. Many of the records stored here are of the utmost value and importance, some of which it would be utterly impossible to replace, but all are liable to be treated alike by the roaches. In the macerating room large roaches also occur. The large species seems to go no higher than one or two stories, and very few of them above the basement. The basement is naturally somewhat damp, is heated by steam in winter, and the roaches have been worst in the darker places. They have not been as troublesome in winter. It also seems that there were more of them in west wing of the building, and not so many on the east side of the wing, the windows of which open into the inner court, as on the west side. The injured records are stored in the basement of the west wing. The walls are very solid, being of stone or iron, with very few cracks or holes therein, and none in immediate vicinity of books most eaten. The corridor outside these rooms is said to be full of the roaches in the early morning.

ECTOBIA GERMANICA.

Upstairs all above second floor, only this species occurs. None whatever occur in the library, which is kept very clean and neat by the lady

in charge, and the rooms are light and dry. In file-rooms on top floor, where only papers are kept (east wing), there are no roaches either large or small. There are no pasted records of any kind in these file-rooms, and employés are not allowed to take any lunch there. The rooms are dry and light, having sky-lights in the roof. No insects of any kind are found there unless brought from other parts of the building, when they soon disappear. The binding room on same floor, and connected with the file-rooms by narrow passages, was visited and *E. germanica* found there and also in printing room next to it. Numerous live specimens in drawers and under books in office, off printing room, were found. Also specimens were seen in these drawers which from the description given me were probably the imago of the clothes-moth. The printing office was formerly in basement where the eaten records are now stored, and these records were at that time kept in the room now occupied by the printing office, which is on top floor. The present change was made out of humanity to the employés, for whom the basement proved too unhealthy. But the basement seems to be equally unhealthy for the records, though from not exactly the same cause. In a room on top floor where some light-house records are stored, some of the smaller species are found, and a number of small paper-bound reports (bound in blue paper) had the backs partly eaten away, evidently to get at the paste. This work did not resemble that of mice, nor did any that I examined. Steam heater in this room.

OTHER INSECTS.

No flights of white ants have been noticed in basement by employés questioned. No other insects which could have any bearing on this question had ever been seen there, and the rooms are not troubled with mice.

REMARKS.

Mr. Youmans believes that dampness or dryness affect the insects very little, but that they stay where there is food to their liking. The safety of these files before referred to is of very serious importance to the officers of the Department, as the chief clerk is held responsible for them all (whether eaten or otherwise), and is supposed to be able at any time to produce any record called for. He can not say it is not there, because a copy has been filed with him; nor can he say it has been destroyed, because there is no law for the destruction of any record. The law does not recognize the agency of insects in this regard. In all these cases of injury it was only those parts permeated with paste that had been molested; therefore as a remedy for the future it would seem advisable to use a *poisoned paste* in the binding of the Government publications.

On May 24, 1888, specimens of the roaches and a sample set of books

were received from Mr. Youmans. The following recommendations were then made:

U. S. DEPARTMENT OF AGRICULTURE, DIVISION OF ENTOMOLOGY,
May 26, 1888.

DEAR SIR: I take pleasure in acknowledging the receipt of yours of the 24th transmitting specimens of cockroaches from your building, and also acknowledge with thanks the receipt of the volumes of the "Senate Report upon Methods of Business in the Executive Departments." The cockroaches sent are not the big Oriental Cockroach, as I had supposed from your description, but belong to the native species known as *Periplaneta americana*, and it is quite evident that this insect alone is the cause of the damage to your books. Under these circumstances I can add nothing to my verbal advice of the other day, which was to use thoroughly and persistently the California Buhach, which Mr. Townsend tells me you have already purchased. This substance does not act upon the roaches instantly, but very few recover which have been touched by it, although they may take a day or so in dying. It has been used with great success in badly-infested houses.

Respectfully, yours,

C. V. RILEY,
Entomologist.

MR. E. B. YOUMANS,
Chief Clerk, Treasury Department.

FURTHER NOTES ON THE HOP PLANT-LOUSE (Phorodon humuli).*

At our last meeting I gave some account of investigations which, up to that time, I had made on the life-history of the Hop Plant-louse, proving that it does not hibernate on the ground nor in any part of the hop-yards, but that it migrates in autumn from the Hop to different species of Plum, both wild and cultivated, and winters on the twigs of the same in the egg state. That communication was made in August, and left some facts covering the period from that time until the ensuing spring problematical and to be ascertained by further investigation. I have since persistently followed up the matter, both in this country and in Europe, and can best supplement the article of a year ago by quoting the following from a communication to the *Gardener's Chronicle* of England for October 22, 1887:

"During the hop harvest (this year in Kent at its height the last week in September), and some time prior thereto, the insects are fast getting wings. This is the only winged generation produced on the Hop, and all individuals, irrespective of brood, show the tendency to become winged, so thoroughly is aphid life, like plant life, influenced by temperature and season. The first to get wings are agamic females, and they instinctively leave the hop-yards and settle upon different varieties and species of Prunus, and begin at once to breed and bring forth young. Their flight is much influenced by meteorological conditions, but they swarm in the air during mild and pleasant days. On my very

* Paper by C. V. Riley before the Society for the Promotion of Agricultural Science, Cleveland, Ohio, August 21, 1888.

first visit to Maidstone several settled on my person while I was being driven from the station, and where wind and temperature were favorable I have known them, in a single day, literally to cover certain sheltered Damson trees close to a hop-yard, where but few could be detected upon the trees the previous day. They array themselves on the underside of the leaves, heads generally all in one direction, and in a very few days they are intersprinkled with their pale and wingless young, though each produces but four to five before dying. These wingless individuals are the only generation produced in autumn on Prunus, and are the true sexual females. White at first, they become yellowish-orange and olivaceous with maturity, the head and the members darkening. The last to acquire wings in the hop-yards are males, and they settle upon the plum leaves (this year most numerously October 5), and fecundate the females, which thereafter lay a few eggs (not more than four or five) around the latent buds, and in any crack or sheltered part of the twigs, especially of the previous year's growth. The eggs, at first yellowish-green, soon get darker, and finally black, and become, in time, more or less covered with dust particles, mold, the exuviae of mites, etc., which adhere by means of the sticky 'honeydew' everywhere produced by aphides.

"The winged males are easily distinguished from the winged females by their smaller size and greater unrest, and when the former are most abundant the latter have disappeared. At the present writing the males are fast dying, and drying up, but the impregnated females still survive, though there have been snow and several white frosts. Some of the later born will doubtless live on till the leaves have fallen; but all will perish with the first severe frost, and the species will be perpetuated through the winter egg, as already set forth. The first eggs were observed on the 8th of this month. My observations show that the winged emigrants from the Hop, while preferring the Damson, feed and breed on all other varieties of Prunus which I have had an opportunity of examining, and which include the Bullace (a yellow plum), the Victoria (large red). the Black Diamond (large black), the Yellow Gage, the Green Gage, and the Orleans. Trees examined in counties where no hops are grown reveal only the Plum aphis (*Aphis pruni*). This species, which remains on the Plum the whole year, also occurs in late autumn in the agamic winged female, the winged male, and the wingless sexual female forms; and though often mixed with the Hop Phorodon, is easily recognized by the want of cornicles or projections at base of antennæ, and by the greener color, darker members, and black eyes of the true female, which oviposits in similar situations as the Phorodon, and whose eggs are scarcely distinguishable from those of that species.

"The absence of Phorodon multiplication on the Hop, and the manner in which stray plants in the field or hedgerow are forsaken, while what I have described is going on upon the Plum, is as marked as the free-

dom of Plum in early summer after the winged migration therefrom to the Hop.

"The observations here recorded have shown (as such minute observations always do) the unreliability of inexpert testimony. As in America, this has been a year of exceptional freedom from hop-lice in England, and when I first visited the hop-yards at the commencement of the gathering I was told very generally by laborers and owners that no lice had been noted lately, whether on the Hop or on the Damson, and that I should find none. Yet, though the leaves of the Hop were remarkably free, I had no difficulty in finding the lice in the burrs, or crawling in all conditions through the loose texture of the sacks which were being filled by the pickers, while the first deposited on Plum were detected on the very first tree examined.

"In conclusion, I have been struck with the great similarity in the general aspect of things both on the Hop and the Plum here and in America. Everywhere parasites and predaceous enemies of the lice, belonging to the same or similar genera, and in some instances the same species, and everywhere the omnipresent Red Spider (*Tetranychus telarius*), and its equally omnipresent spherical reddish eggs at this season. And while the lower average summer temperature will cause fewer generations of the Phorodon to be produced in England (probably only six or seven) than in America (where thirteen have been traced this year), and the beginning and ending of the insect's activity will be more abrupt there than here, yet in all essential points the life-history of the species in the two countries is the same."

These facts which I obtained in England were independently confirmed by my assistants in this country during the same period, and the correspondence between the facts observed on both sides of the Atlantic has been set forth in a communication to the *Country Gentleman* for November 17, 1887, by my first assistant, Mr. Howard, from which I quote the following:

"Professor Riley's observations in England I shall quote in his own words from a communication written to me from Maidstone, October 8. The exact correspondence is marked, and is even surprising when we consider the different conditions of temperature and rain-fall.

"'I shall be able after all to get to the continent without intrusting any one else here with the *finale re Phorodon*. I have the whole thing complete. Egg laying began not more than two days ago, and with the last two warm, pleasant days it is going on rapidly, the males being active in fecundation. I have not much time to write, but the facts are all as pat and clear as day here. From middle to 25th of September, while hops were being gathered, the winged females were developing and leaving the hops. On Prunus of all varieties—but particularly on Damson—they settle and begin to feed and produce young. When weather and wind are favorable I have seen them cover trees in two days so that every leaf would have a dozen or more, generally heads

all one way, and their pale young would soon begin to get abundant. However, they are not so very prolific, and produce at most half a dozen young. These, without exception, are the true females, so far as I have been able to make out, and develop slowly according to temperature, the earliest produced only just now laying. About the time the winged females begin to die the winged males take their places and fecundate the wingless females so soon as these are sufficiently mature. The appearance of the winged males settling in all positions, and restless, is quite in contrast with that of the more plump and sedate winged females.

"'This means that the last generation from Hop gives us the winged parthenogenetic female (return migrant) and the winged male—the latter somewhat later than the former and representing the remnant or devitalized residuum—the closing nutrient power of Humulus being sufficient to produce a male, but not a female! So that only the true sexual female is produced on Prunus in autumn.

"'From appearances she will not lay more than five or six eggs, and these are placed as in *pruni*, *mali*, etc., by preference around base of nascent or latent buds and in cracks and crevices of last year's growth, though sometimes (destined to perish) on leaf or smooth, green stem. They are smooth and olive-green at first, becoming darker. * * * The essential facts which I have published are all verified.

"'The true females are all white at first and indistinguishable from young of other generations, but they gradually grow more orange and then olive, the head and members getting darker, and the anus, especially after coition, black.'"

The statements therefore in my paper of a year ago are substantially correct, and the principal facts ascertained since may be thus briefly summarized:

(1) The insects begin getting wings in autumn irrespective of generation. These winged females may either come from the fifth generation of the year or as much as the thirteenth, thirteen generations having been followed during the year 1887.

(2) The males uniformly appear after the females and after the hop crop is harvested. Hence it becomes extremely important to destroy by fire or by thorough drenching with a strong kerosene emulsion all the hop-vines as soon as possible after the crop is harvested. This would cut off the larger bulk of the males so that there would be no impregnation of the sexual females, which are for the most part at that time already on the Plum.

Another interesting fact is worthy of record here; it is the small proportion of eggs which survive the winter. In the fields and orchards where my observations were made in England some trees were literally covered with eggs, and I brought a number of them with me to this country. The same was true of the plum trees in New York, which were under observation by my assistants. Some of them were literally

covered with winter eggs. I watched them carefully, not only by means of those brought with me from England, but of others brought from New York in the late fall or early winter, and still other specimens repeatedly received during the winter from Richfield Springs. As the hatching period approached I was quite surprised to find how many of the eggs shriveled up and perished. I also made it a point to be on the spot as soon as vegetation began at Richfield Springs, and found there, in a state of nature, the same mortality among the eggs. The large majority of them that had escaped natural enemies had perished by shrinking and shriveling. Again, the stem-mothers, which hatched on Plum last spring, though they were few compared with the number of eggs that had been provided, were for the most part lost through storms or the working of natural enemies, so that a very small proportion succeeded in developing. A number of additional interesting details of an entomological character have been obtained since the last meeting of the society, but they will be brought together in a forthcoming report from the Department of Agriculture.

The whole record has been rendered the more difficult by virtue of the occurrence of a very closely allied species (*Phorodon mahaleb*), which, though hatching at the same time as, and very similar to, *humuli*, does not migrate to the Hop, but goes to various other plants of no importance in cultivation.

LIFE-HISTORY OF GRAPTODERA FOLIACEA Lec.

BY MARY E. MURTFELDT.

In Bulletin No. 3 of the Kansas Experiment Station Professor Popenoe has a very interesting illustrated article on what he denominates "A New Apple Insect." This paper was the more interesting to me inasmuch as it anticipated—in the matter of publication—certain observations of my own on the same species.

About the 1st of June of the present year a correspondent sent me, from Colorado, a package containing a dozen specimens of a flea-beetle, closely resembling in size and form the Grape-vine Flea-beetle (*Graptodera chalybea*, Illig.), but differing in color, being of a highly polished metallic green instead of blue. The apple leaves inclosed with these specimens were riddled with small, irregular perforations, and I was informed that these leaves correctly represented the condition of the foliage of most of the young trees in an extensive nursery—that of the Stark Bros., near Denver, Colo.

As the species was unknown to me, I inclosed specimens to Professor Riley, who kindly determined them for me as the species under consideration. Professor Riley informed me that he had observed the work of the beetle and its larva in Missouri in 1872 feeding upon Hawthorn; also in 1877 in Colorado, and had published a brief account of it and its

life-history, with a description of the larva, in the *Scientific American* for June 16, 1887, and in the *Gardener's Monthly* for July 19, 1887 (vol. 29, p. 216), under the name of *G. punctipennis*, which is a synonym of *foliacea*.

I placed my beetles on fresh apple leaves and awaited developments.

More than a month elapsed before I found any eggs in the jar. On the 9th of July I found several clusters attached to the stems and bases of the midribs of the leaves. They are generally in twos and threes, ranged side by side. They are about one millimeter in length, slender, oblong rather than oval, of a pale, dull orange color, somewhat translucent, and Professor Popenoe, who has also obtained them, says that "under a high magnifying power the shells are seen to be minutely granulated."

By the 17th of July a number of larvæ had hatched. They are nearly cylindrical, of a dull black color, and rather more elongate in proportion to their diameter than the larvæ of *G. chalybea*. When grown they feed on the parenchyma of the leaf, indifferently on either surface, but later they gnaw holes in it similar to those made by the perfect insects. The first molt took place in eight days, and two or three of the small larvæ perished in the process, being unable to entirely withdraw themselves from the outgrown skins. The second molt occurred one week later, and in this also one larva perished. During these periods there are no changes of color or maculation. August 2 one larva had completed its growth, and as it was making its way into the earth I put a stop to its further development by transferring it to the alcohol bottle. The following characters were noticed: Length of mature larva from 6 to 7 millimeters; diameter, 1½ millimeters; form, cylindrical, tapering somewhat posteriorly; general color varying from dull black to dark fuscous; piliferous plates inconspicuous, of the same shape, number, and arrangement as those of *G. chalybea*, black in color and slightly polished, each giving rise to from one to three minute hairs; head rounded, cordate, deep black, but not brilliantly polished; prolegs well developed, faintly annulate at the joints with dingy white.

The larvæ move about considerably, but in a slow and rather clumsy fashion, with the tip of the abdomen appressed to the surface of the leaf or stem to assist in keeping them in position.

The pupa is inclosed in a frail earthen cocoon or cell, just beneath the surface of the ground.

None of the beetles from this brood have emerged, and it is possible that they may hibernate. Several of the parent beetles were, August 14, still alive and as voracious as ever, while eggs and young larvæ were still to be found on the leaves.

August 14 two larvæ entered ground and the beetles emerged on the 28th of the same month—the duration of the pupal stage of life, being less than two weeks.

September 1. The last beetles of the spring brood have just died, possibly from a lack of fresh food more than from old age, as I was absent from home and could not give them personal attention. The probabilities are that the second brood of these beetles hibernates and lays its eggs early in the season for the production of the beetles that are so destructive throughout the summer.

It will be seen from this account that *G. foliacea* is an all-summer pest and capable of inflicting a vast amount of injury in the nursery and young orchard.

The gentleman from whom I obtained the specimens wrote me that he had tried in vain to check its ravages with pyrethrum, kerosene emulsions, Paris green, etc., in the proportions and by the methods usually recommended, but that he had succeeded in destroying it without injury to the trees by the use of white arsenic, 1 pound to 200 gallons of water, the arsenic being first boiled in a small quantity of water and then diluted to the proportions given above.

A MAN-INFESTING BOT.

[Extracted from a paper* by RUDOLPH MATAS, M. D.]

On the morning of June 27, H. T. McC., an Englishman, aged thirty-eight, presented himself at my clinic in ward 8, Charity Hospital, stating that he had arrived in this city one week before from an extensive trip to Spanish Honduras, where, on or about the 11th of this month (June), he had been stung, while bathing, by a peculiar fly, which was well known in that country, as it was a veritable nuisance, if not a scourge, because it attacked man and beast alike—the white foreigners especially—and deposited its ova in the sting, wherein the "worms" (larvæ) developed until they attained considerable dimensions—half to three-quarters of an inch in length, according to the patient's statement. He further stated that he remembered the moment when the fly stung him, for he heard it "buzz," and felt it "sting" him in three distinct places on his body, where he was sure the "worms" were now growing, "though they must still be quite young and small, on account of the comparatively short time that they had been in the flesh"—*i. e.*, sixteen days since ova had been deposited.

We then examined the patient, who, after undressing, showed us three red, hard, furuncular swellings, situated, one on the right side of

* This paper was published by its author, Dr. Matas, Visiting Surgeon, Charity Hospital, New Orleans; Demonstrator of Anatomy, Medical Department, Tulane University, at New Orleans, in September, 1887, for private distribution, under the title "Report of the case of a patient from whose subcutaneous tissue three larvæ of a species of *Dermatobia* were removed; with remarks." Dr. Matas has had considerable correspondence with the Division and we may have some further remarks upon the subject in a future number.

the intergluteal furrow, about 2 or 3 inches from tip of coccyx, and two other similar, though smaller elevations on the left side of the same furrow and closely adjoining one another. The first, which was the most prominent, was elevated at its highest portion about one-quarter of an inch from the level of the surrounding skin, and presented a circular area of inflammatory hardness which measured about $1\frac{1}{4}$ inches in diameter. Upon careful and minute inspection the largest furunculoid mass was found to present in its most elevated and central portion a minute orifice, which might admit the point of a coarse bristle. The other two swellings presented also one central point each, where a little puriform crust had become fixed, indicating the original seat of puncture and entrance to the larval sinus.

Trusting to the patient's account of himself, we proceeded to the extraction of the parasites—a procedure which the patient urgently requested. Guided by the orifice in the elevation I cut with the point of a bistoury into the very center of the swelling, but discovered, however, that by simply cutting vertically I had not incised the cavity wherein the larvæ lay concealed, and was obliged to again incise obliquely and to the right in order to expose the parasitic burrow. This oblique direction of the larval sinus I found to be constant in each of the three "stings." I found that the larvæ were lodged immediately under the derma proper, so that in getting at them, in order to expose them thoroughly, I had to cut completely through the skin, which, in the gluteal region is particularly thick. It was discovered also that a simple incision was insufficient to remove the larvæ, and that digital expression, and this very forcibly applied, was necessary in order to induce them to relinquish their stronghold. In fact, the two last larvæ were removed more by this means than by incision, the orifice of the sinus having been simply incised in order to enlarge the orifice of exit, and the parts expressed by pinching them in a fold of skin. The patient stated that in Honduras the natives usually rid themselves of these unpleasant guests by applying hot tobacco ashes to the parts and following this up by digital expression. This is a rather general treatment for parasitic dermal affections in Latin-American countries where tobacco is always on hand. In our patient's case we cauterized the cavity or sinus left by the evacuation of the larvæ with pure carbolic acid, for fear that the septic products of larval nutrition might tend to create inflammatory mischief. I was led to this precaution because of the unfortunate results which followed the extraction of similar parasites in another case, that of a Frenchman, also from Honduras, who was admitted in the same ward during my absence, about twelve months before, and who nearly succumbed to a most violent and disastrous attack of erysipelas, which supervened immediately after the slight traumatism inflicted in the extraction. The larvæ had been deposited in the inner surface of the left arm, and from this point the inflammation spread on all sides, swelling up the whole extremity and left thoracic region. Subcutaneous

suppuration, accompanied by gangrene, followed, finally leaving the arm in a state of permanent contraction in the flexed position, as the result of cicatricial action. Happily, in the present case, the extraction of the larvæ has not been followed by any excessive inflammatory reaction, owing, perhaps, to the general good health enjoyed by the patient at the time of the operation.

Since this case has come under my observation I have been informed that similar instances of larval deposits in the skin have not been rare in the hospital, at least since the Panama Canal and other enterprises have increased the traffic between this port and the Central American Republics. I have been informed, in fact, that on one occasion quite a number of returning laborers or immigrants were admitted in various wards of the Charity Hospital suffering with these parasitic larvæ. But of these cases no report has been presented thus far, and to my knowledge at least no attempt has been made to discover the parentage of the larvæ or even to determine their proper entomological characters. The specimens removed from my patient are the first that I have seen, and I believe are the first that have been preserved for examination and, certainly, for the inspection of this association. At any rate these larvæ are certainly not familiar to our parasitic pathology, for our texts, and even those that devote special attention to parasitology (Cobbold, Leuckart, Davaine), are almost barren of all information in regard to them; so that it is necessary to appeal to the special entomologists to obtain some clear notions as to their exact taxonomic characteristics.

In view of our prospects of increased relations with Spanish America, and of the probability of a future importation of similar specimens, I have thought it a matter of some interest to this society to inquire into the natural history of these hypodermatic parasites, in order that we may at least possess ourselves of some clear ideas respecting them, so that they may prove more familiar acquaintances when we are again confronted by them.

The three specimens that are now under the microscope before you are mounted in a glycerine cell, a preparation which was kindly made at my request by the gentlemen in charge of the pathological department of the hospital. The larvæ are smaller than they appeared in life, as they have contracted slightly. The largest of these measures about 4 or 5^{mm} in its long diameter and is about $1\frac{1}{2}^{mm}$ in breadth. To the naked eye they present an elongated pyriform or clavate appearance, the broad, thick and rounded portion corresponding to the head and trunk, which were the parts furthest from the surface of the skin; the long, tapering or caudal extremity pointed upwards, so that in squeezing the larva out of its lodgment the tail end appeared first. As the caudal extremity presented itself a dark red dot was visible at the very extremity. This corresponded to the dark anal extremity containing the stigmata for respiratory purposes, and is characteristic of, though not peculiar to, the *Dermatobia* larvæ.

This is the normal position of these parasites in general, for the respiratory apparatus which is attached to the caudal portion, close to the anus, is placed near the opening originally made by the sting of the parent fly, in order that they may be as close as possible to the atmosphere. When the larvæ were extracted they wriggled quite actively in their vermicular movements, and continued to move until they were embalmed in the cell five or six hours after their extraction.

On microscopical examination of the most perfect specimen (with a low-power three-quarter objective, B. and L., eye-piece B.) a remarkable appearance is presented. The major portion of the parasite is seen to consist of an elongated, pyriform, tuberose, or exaggerated clavate body, apparently concave on the ventral aspect and convex dorsally, terminating in a long, tapering, glabrous, elongated-pyramidal extremity. The broader and truncated part of the larva is opaque, and none of the contained organs can be distinguished. The external surface presented the curious appearance which is well displayed in Fig. 10 (*a* and *b*).

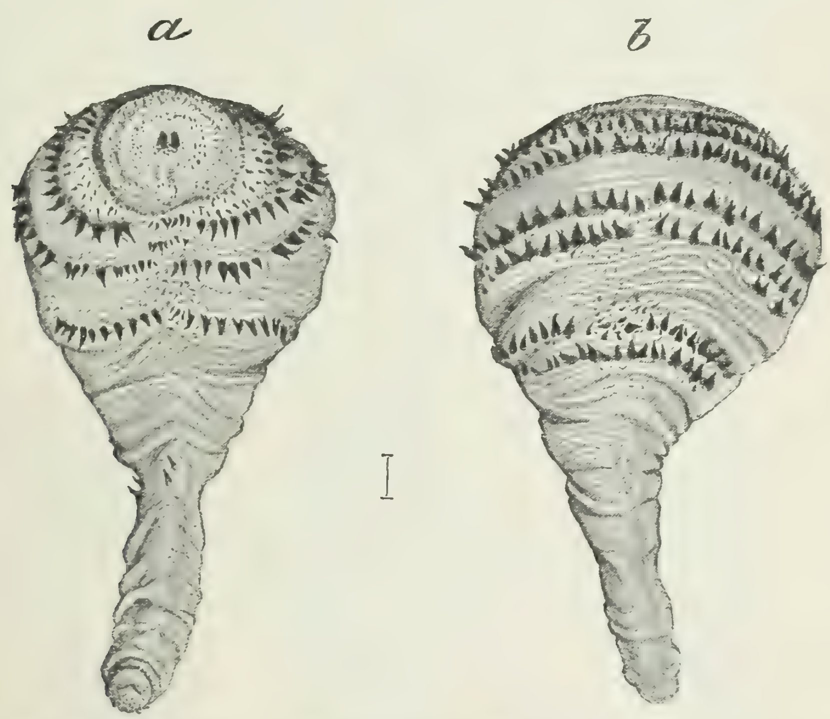

FIG. 10.—One of the larvæ viewed in its *ventral* (*a*) and *dorsal* (*b*) aspects. At *a* is shown the ventral aspect and the appearance of the cephalic and caudal extremities, also the three rows of spines single below, and the point where the double dorsal rows end; *b* gives the dorsal view and shows that the three rows of spines single below are double above. Hair line between indicates the natural length. (From drawings made for the author by courtesy of the U. S. Entomologist.)

Corresponding to the three dark zones distinctly outlined with the naked eye are seen three *double* rows of black hooklets or spines, which are distinctly shaped, when examined carefully, like the thorns of a rose stem. They are lamelliform, sharply pointed at the ends, and are curved and directed (the majority) towards the caudal extremity, so that, if embedded in the tissues lining the larval sinus, they would offer a resistance to caudal traction in direct ratio to the force employed. This arrangement is manifestly calculated to assist the larva in retaining its position in the subcutaneous tissues, and especially in prevent-

ing any involuntary migrations from regions subjected to great muscular disturbance. They may also assist in burrowing, though advance or head movements do not appear to be habitual with these larvæ, as they, in common with most ectodermic parasites, are not anaerobic (to use a Pasteurian phrase), but require the presence of atmospheric oxygen for their maintenance.

As regards the disposition of the spines it is a noticeable fact that they differ markedly as to their arrangement according to the aspect of the parasite examined. Thus, as is plainly shown in Fig. 10 (*a* and *b*), the three rows of spines are single on the ventral and double on the dorsal aspect, the point where the double row ceases being plainly shown in *a*. This peculiarity is also distinctly exhibited in the species illustrated by Fig. 11, plainly indicating the relationship that exists between them.

The only segments that are distinctly outlined are the first, which represents the cephalic end, containing the oral cavity, armed with two styles, Fig. 10 (*a*), and the second, which immediately follows it. As these specimens have shrivelled considerably since the time of extraction, the segmentation is not as plainly visible as it should be.

The caudal extremity is also distinctly shown, though the details of the stigmatous organs are not as plainly delineated as desirable, as the stigmata are doubtless hidden within the anal fissure. In this respect they differ from Brauer's (Fig. 11, *a*, *b*, *c*) and Coquerel's (Fig. 11, *d*) specimens of similar larvæ, with which they otherwise appear to be closely related.

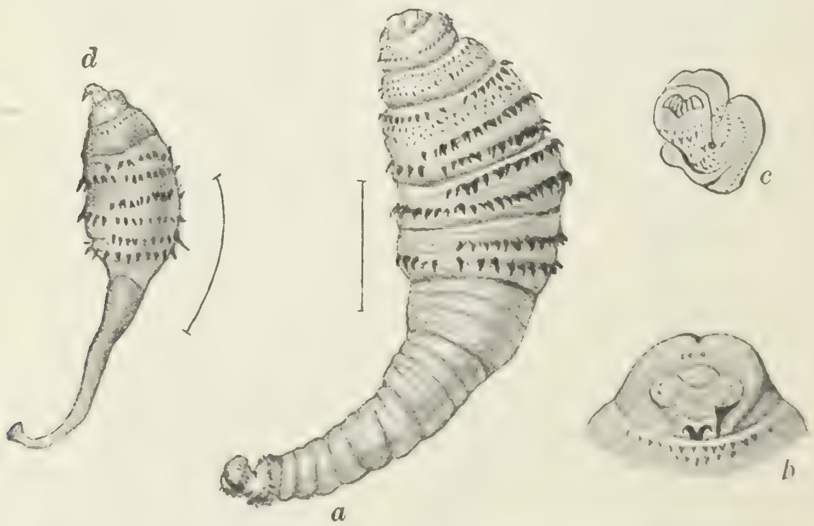

Fig. 11.—*a*, Brauer's figure of entire *Dermatobia* larva, supposed to be closely allied to specimens shown in Fig. 10; *b*, cephalic extremity; *c*, caudal extremity of same specimen; *d*, *Dermatobia* larva figured by Coquerel, and closely related to if not identical with preceding, only seen under a lower power and perhaps in an earlier period of development. (From figures kindly furnished by the U. S. Entomologist.)

In addition to the three rows of hooklets, a large number of small punctiform and blackish tuberosities are seen dotted in a somewhat concentric manner above the upper row on the two upper segments and the vicinity of the oral point.

STEPS TOWARDS A REVISION OF CHAMBERS'S INDEX,* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord WALSINGHAM.

In attempting a gradual revision of the late Mr. V. T. Chambers' Index of the Tineina of the United States and Canada, published exactly ten years ago, I do not propose to take the genera in systematic order, nor alphabetically as in the original publication. I shall commence with those genera at present best known to me and in which the material at my disposal is sufficient to enable me to add something to the knowledge of the subject. It will be easy to compile a new list if the revision should be ever completed. I fear it may be some time before any satisfactory knowledge can be obtained of the majority of the species in the great genus *Gelechia.* The genera *Lithocolletis*, *Gracilaria* and *Tinea* also present considerable difficulties to any one who is not in a position to examine the types of American authors. I hope that by publishing the lists of different genera from time to time I may call forth some useful observations from others who are acquainted with the subject, and thus accumulate material for a complete catalogue. To Dr. Riley, Professor Fernald, and Miss M. E. Murtfeldt I am constantly and gratefully indebted for specimens and information.

CLEODORA, Curt.

Two species of this genus have been recognized by Chambers as occurring in the United States. Both are described by him in the sixth volume of the Canadian Entomologist, p. 245, and both are subsequently referred to by the same author in the Bulletin of the United States Geological and Geographical Survey, Vol. IV, No. 1, pp. 91–92. These are *Cleodora pallidistrigella* Chamb. and *Cleodora pallidella Chamb.*

The first is said to differ slightly in its neuration from the European type of this genus. It is described thus: "Thorax and primaries pale orange; paler, nearly white along the dorsal margin and on the extreme costa beyond the middle; a narrow, indistinct, whitish line along the fold, ending at a small brown spot; there is an oblique, narrow, whitish streak along the base of the costal cilia; a minute brownish spot surrounded by a pale ring at the end of the disk, and an oblique brownish streak in the cilia at the apex. The brown spots are all indistinct. The palpi pale yellowish; a spot on the top of the third joint and the brush on the second joint reddish ochreous. Al. ex., $\frac{5}{8}$ in."

Under the second of the two references given above, the descriptions of both species are amended and elaborated, but some of the amendments to the description of *C. pallidella* can only apply to that of the other species, the spelling of which is here corrected to *C. pallidistrigella.* The wide range of variation indicated points to the probability that Chambers had before him at the time more than two allied species of this genus. I have had an opportunity of examining a specimen of *C. pallidistrigella* from Texas, lent me by Professor Riley and received by him from Chambers as a type of the species. A coloured drawing of this specimen is now before me. It

*Index to the described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv. IV (1), February, 1878.

is certainly a *Cleodora* distinct from all American and European species with which I am acquainted, although somewhat resembling in general appearance *Cleodora striatella* Hb.

A specimen of *C. pallidella* is, I believe, in the collection of Miss Murtfeldt, but I am not acquainted with the species.

The only other allusion to the genus *Cleodora* as possibly occurring in America is to be found in Stainton's edition of Clemens' papers, p. 111, where in a foot-note the editor mentions that he is not confident that *Anothosia* Clem. is generically distinct from *Cleodora*. Chambers (Can. Ent. VI, p. 245) discusses and rejects the theory of their identity chiefly on the grounds of neuration and of the form of the palpi. The palpi of my single specimen of *Anothosia* certainly resembles those of *Pleurota* more nearly than those of *Cleodora*.

The figure of the hind-wing of *Parasia* in Stainton's Lepidoptera Tineina (Insecta Britannica) indicates scarcely sufficient indentation before the apex. In this respect *Parasia* more nearly resembles *Cleodora*, from which it differs chiefly in the form of the palpi. The neuration of the fore-wing of *Parasia* also differs from *Cleodora* in respect of the addition of a second costal branch to the apical vein, and this is the same distinction mentioned by Chambers as characterizing his North American species of *Cleodora*; nevertheless, his specimen of *pallidistrigella* seen by me was not a true *Parasia*. The following five species, of which four are new, may now be added to the North American representatives of this genus. The new ones, which have the strong brush on the palpi which distinguishes *Cleodora*, possess the same peculiarity of neuration as those described by Chambers. It is possible that when more material shall have come to hand a new genus intermediate between *Cleodora* and *Parasia* may be usefully characterized for their reception.

I hope at some future time to publish figures of these and many other North American *Tineidæ*.

Cleodora striatella Hb.

I took a single specimen of this species in Colusa County, Cal., June 29, 1871. It is exactly similar in all respects to the typical European form.

Cleodora modesta sp. n.

Antennæ, fuscous, faintly annulated with hoary scales.
Head and palpi, hoary.
Tongue, clothed at the base with hoary scales.
Thorax, greyish anteriorly, shading to pale umber-brown posteriorly.
Fore-wings, unicolorous pale umber-brown, dotted around the apex with intermixed fuscous and hoary scales; a line of white runs also through the middle of the apical cilia; cilia grey.
Hind-wings, pale greyish; cilia a with slightly darker tinge.
Abdomen, brownish, grey.
Legs, grey.
Exp. al., 10-11^{mm}.
Habitat, Los Angeles, Calif., July.
Type, ♀, *Mus. Wlsm.* 1 ♂, 2 ♀, in the collection of Professor Riley (U. S. N. M.).

Cleodora canicostella sp. n.

Head, thorax, and palpi, with long projecting tuft beneath; hoary grey.
Fore-wings, brown, with green or rosy iridescent tips to the scales, especially on the outer half of the wing, visible only in a strong light; the middle third of the costa narrowly white, the white streak widening outwardly; beyond it is an outwardly oblique costal streak which crosses the wing before the apex, followed by an inwardly oblique small white costal streak and some fuscous dots in the cilia;

along the apical margin runs a white line in the cilia between two narrower fuscous lines; there are a few fuscous scales at the anal angle and above them a short longitudinal white streak; a short fuscous streak beyond the middle of the fold almost reaches the commencement of a more conspicuous discal streak of the same colour immediately above it, both margined by a few inconspicuous whitish scales.

Hind-wings, brown, with a purplish tinge; the cilia brown.

Exp. al., 12^{mm}.

Habitat, Mt. Shasta, California, Aug. 1, 1871.

Type, ♂ ♀, *Mus. Wlsm.*

This approaches the Texan species described by Chambers.

Another species, or perhaps only a variety of the above, obtained on Burney Creek, Shasta County, Calif., a few days previously, has the costa white to the base, the fold white, and the white line in the fringes with its fuscous outer margin reduplicated

Cleodora tophella sp. n.

Palpi, with long projecting tuft of mixed whitish and cinereous scales beneath, slightly darker on their outer than on their inner sides, the apical joint shaded beneath.

Head, pale cinereous.

Antennæ and thorax, slightly darker.

Fore-wings, dull ashy brown, with a considerable sprinkling of brighter (more reddish brown) scales; the tips of the scales about the apical margin and cilia are paler and give a speckled appearance to the end of the wing.

Hind-wings, brownish cinereous; cilia scarcely paler.

Abdomen, the same colour as the hind-wings, with subochreous anal tuft.

Posterior legs, the same colour, the tarsal joints with subochreous spots.

Exp. al., 23^{mm}.

Habitat, specimens taken May 24, 1871, in Mendocino County, Calif.

Type, ♂ ♀, *Mus. Wlsm.*

I have specimens from Shasta County, Calif., July 24, 1871, which differ from the above in their smaller size (exp. al., 12^{mm}) and in their whiter heads and palpi, the tuft on the latter being less prominent. These probably belong to a second brood of the above species.

Cleodora sabulella sp. n.

Palpi, fawn white.

Head and thorax, rather more decidedly tinged with fawn-colour, the face paler.

Antennæ, annulated with fawn-colour, and fawn white.

Fore-wings, fawn-colour with a slight brownish tinge towards the apex, where there is some appearance of pale speckling owing to the tips of the scales about the cilia and apical margin being of a lighter hue.

Hind-wings, fawn colour, with a greyish tinge; the cilia fawn-coloured.

Abdomen and posterior legs, paler, corresponding more in colour with the thorax.

Exp. al., $14\text{–}15\frac{1}{2}^{mm}$.

Habitat, 18 specimens taken in Bear Valley, Colusa County, Calif., June 27, 1871.

Type, ♂ ♀, *Mus. Wlsm.*

DACTYLOTA* Snell.

This genus has hitherto been represented by a single species found on the shores of the Baltic and North Sea, in the west of Europe. It is immediately recognizable by the peculiar form of the hind-wings in the male, which are not merely emarginate below the apex, as is usual in the *Gelechinæ,* but are deeply excised, having the apical

* According to strict rules of nomenclature the name *Dactylota* is preoccupied in *Echinodermata* and should be changed.

margin of the wing divided into two finger-like lobes, the upper, or costal one, being double the length of the lower, or dorsal lobe. There is a slight difference in neuration between the North American and European forms, the species here described having the discal cell of the fore-wing not narrowed to a point, as in Snellen's figure (Tijd. v. Ent., XIX, Pl. I), and the veins that leave its margins are distinctly separate from each other at their bases; moreover, the apical vein, which is forked, throws its lower branch almost to the apex of the wing, or very closely above it. The long and slender apical joint of the labial palpi also serves to distinguish the American from the European species.

Dactylota snellenella sp. n.

Antennæ, simple; basal joint scarcely wider than the stem.

Palpi, recurved, slender; second joint longer than the head, clothed with short diverging scales beneath, smooth above; apical joint very slender, smooth, longer than the second, in this respect differing from *kinkerella* Snell., which has much shorter palpi.

Tongue, rather long, scaled at the base, naked beyond.

Head and thorax, greyish, sprinkled with brownish scales.

Fore-wings, elongate, broadly lanceolate, costa slightly arched near the base; with 12 veins, 7 and 8 from a common cell; greyish, sprinkled with brownish scales, having a slight iridescent hue in a strong light. There are 3 very conspicuous patches of very dark umber scales, the 1st within the basal fourth, adjacent to the upper edge of the fold; the 2nd within the basal half of the disk, slightly above the middle of the wing; the 3rd, at about the end of the cell, larger and more conspicuous than the preceding two, is followed by an ill-defined band of very pale grey scales, stretching from the costal to the dorsal margin; the apical portion of the wing is faintly sprinkled with similar pale scales; a narrow line of subochreous scales runs nearly parallel with the costa, from the base for about one-third of the length of the wing; a few dark umber scales are also observable about the middle of the fold; cilia very long, rosy-grey, sparsely dotted with brown along their base.

Hind-wings, ♂, shining, pale greyish, also iridescent in a strong light; as wide as the fore-wings; costal and dorsal margins parallel; apex produced, obtusely pointed; apical margin deeply indented, forming a short obtuse second lobe; the fissure is rounded at the base; abdominal angle rounded; the abdominal margin nearly straight; cilia very long, having an ochreous tint. On the under side is a tuft of long, hair-like scales from the middle of the base, lying parallel to the upper edge of the 2nd lobe.

In the ♀ the hind-wing, although deeply indented below the apex, is not divided into two lobes, its form being rather that of the genus *Cleodora;* the tuft of hairs on the under side is also absent.

Abdomen, greyish, rather wide and flattened; anal tuft faintly ochreous.

Exp. al., $17\frac{1}{2}^{mm}$.

Habitat, Arizona. 2 ♂ and 2 ♀ received from the late H. K. Morrison in 1883.

Type, ♂ ♀, *Mus. Wlsm.*

The species is named after the well-known author of "De Vlinders van Nederland," who, in one of his numerous and valued papers on Microlepidoptera, first described the European representative of this genus.

(To be continued.)

EXTRACTS FROM CORRESPONDENCE.

The Strawberry Weevil in Pennsylvania.

In the inclosed block I send you a few specimens of an insect which is causing a great deal of damage to the strawberry crop in this vicinity. I send a few buds showing how the mischief is done, and up to the present writing about one-half of the crop has already been destroyed, on some of the stalks not a berry being left. The inclosed specimens were caught yesterday in the act of cutting the stem; hence I send them to you and would like to know what species of insect it is, and could you suggest a remedy to stop further depredations, as I am anxious to save at least a portion of the crop. The injury amounts to hundreds of dollars on single plantations, at least so estimated by the number of blossoms cut off, some stalks having only two or three berries left and twenty or thirty blossoms. * * * In 1885 this insect made its first appearance, but in 1886 it was not noticed.—[Lawrence J. Krieg, Etna, Allegheny County, Pa., May 23, 1887.

REPLY.—Yours of recent date accompanying specimens of an insect which is damaging your strawberry crop has come to hand. This insect is the destructive Strawberry Weevil (*Anthonomus musculus*), which I treated at some length on pages 276 to 279 in my last report as Entomologist to this Department. I have to-day requested that a copy of this report be sent to your address, so you will be able to study the insect at your leisure. I have been unable to do much more than suggest remedies so far, as the life-history of the insect has not yet been made out. After reading the article carefully you may be able to find out where the beetles go and where they lay their eggs; and if so, an important step will be gained. If you try the kerosene emulsion, or the pyrethrum, or gas-lime and sawdust, I should be glad to learn the result [May 25, 1887].

Graptodera punctipennis injuring Nursery Stock.

I inclose you some small bugs that are eating all the leaves of my young apple and are beginning on all my young nursery stock. I think they will, if they continue, destroy my nursery. Please examine and tell me how to destroy them. They appeared about two weeks ago. I never was troubled with anything of this kind before.—[J. R. Johnson, Dallas, Tex , to H. E. Van Deman, May 10, 1887.

REPLY.—Your letter of the 10th instant addressed to Mr. Van Deman, the pomologist of this Department, has been referred by him, with the specimens, to this Division. The little green beetle injuring your young apple trees is known by the scientific name of *Graptodera punctipennis*. This insect is a near relative to the Grape-vine Flea-beetle, and its habits are very similar. The best remedy for this insect will consist in spraying your young trees with a dilute solution of Paris green or London purple. The appearance of this insect in injurious numbers is rare, and we shall be glad to hear from you further as to the amount of injury and as to the success of this remedy if you decide to apply it [May 14, 1887].

Lachnosterna hirticula injuring Poplars and Oaks.

I have several North Carolina Poplars in which have swarmed and roared, for several evenings after nightfall, myriads of beetles, samples of which I inclose.

Please inform me whether they mean evil to the Poplar and whether they or their progeny are injurious to vegetation of any sort.—[Rev. William C. Butler, Leeland, Prince George's County, Md., May 17, 1887.

REPLY.—* * * The insects which you inclose belong to one of the common May beetles (*Lachnosterna hirticula*), and are the parents of the so-called white grubs. The beetles themselves are leaf-eaters, and you will probably find that the leaves of your

North Carolina Poplars have been gnawed by them. You should not lose the opportunity to destroy these beetles, which can be done by placing a lantern suspended over a pan containing water with a thin scum of coal-oil on top near the tree. If the beetles are extremely numerous several of these trap lanterns will be necessary to destroy them. The same insects are just now damaging the Oaks upon the grounds of this Department. [May 18, 1887].

Insects Confounded with the Hessian Fly prior to the Revolution.

Du Hamel does not mention the Hessian Fly by name, but on page 90, referring to insects injurious to corn, says:

"There is a smaller kind of worm, which gets into the roots, chiefly oats, and, working upwards, destroys all the inside of the plant, which perishes soon after. I suspect it to have been an insect of this kind that destroyed so much wheat in the neighborhood of Geneva, and which M. de Chateauvieux describes thus: 'Our wheat in the month of May, 1755, sustained a loss, which even that cultivated according to the new husbandry did not escape. We found in it many little white worms, which afterwards became a chestnut color. They post themselves between the blades and eat the stems. They are usually found between the first joint and the roots. Every stalk which they attacked grew no more, but became yellow and withered. The same misfortune happened to us in the year 1732. These insects appeared about the middle of May and made such havoc that the crop was almost destroyed.' (*Verbatim et literatim* from the work of M. Du Hamel du Menceau, New Hamburg edition, 1759.)

The Angoumois Moth is also fully described by the author. If the above does not refer to the Hessian Fly it must be some closely allied pest. I have eight volumes of Arthur Young's works, but have not had the time to examine them for *flies*.—[A. S. Fuller, Ridgewood, N. J., July 16, 1888.

REPLY.—I thank you for the extracts from Du Hamel. The first indicates very plainly that it has no reference to the Hessian Fly, but the second has one expression that might apply to the Hessian Fly, viz, that about "posting themselves between the blade," but unfortunately this is more than offset by the statement of their eating the stems, and this proves with sufficient conclusiveness that it was not the Hessian Fly but a species of *Chlorops*. As you are aware these also have pale larvæ and become brown in the pupa state, while one species at least is frequently found between the blades. No, there can be no question whatever that this case refers not to the Hessian Fly but to some species of *Chlorops* or *Meromyza* or to one of the many species of insects which are known to attack small grains in a somewhat similar way. There is not a particle of positive evidence of the existence of the Hessian Fly at that early period in this country, and the reference to Du Hamel in the minutes of the American Philosophical Society, May 18, 1768, is undoubtedly to his article on the Angoumois Grain-moth. * * * [July 23, 1888.]

Injury from non-migratory Locusts in Michigan.

I will send you some grasshoppers that have destroyed all the oats about this section. What is left is worthless, as there is nothing left but the shell. I notice that the first brood is gone; they were very large. The second brood is growing fast. They had large wings, much longer than the body. * * * If they breed very fast they will clean us out. I have traveled about among the farmers on purpose to see the crops; all are much injured.

The boys say they have seen the locusts on the bushes and trees in the woods. They did not injure crops any. * * * I don't travel in the woods much. I would like to know what the seventeen-year means. Do they come every seventeen years or will they stay seventeen years?—[Anthony O'Donnell, Saint James, Manitou County, Mich., August 27, 1888.

REPLY.—The box of locusts has been received. The specimens were one female of the Red-Legged Locust, *Caloptenus femur-rubrum*, and two specimens—one male and one female—of the Two-striped Locust, *Caloptenus bivittatus*. These are both common species and widely distributed. They occasionally increase in large numbers, and, though non-migratory, often cause considerable damage to crops. The specimens you refer to as having wings a great deal longer than the body no doubt belong to another genus, probably *Acridium* or *Œdipoda*.

In regard to the Periodical Cicada, the "seventeen-year" means that they appear at intervals of seventeen years. We mail you a copy of Bulletin 8 on this insect, which will give you its history. Did they appear in large numbers in your locality? Can you send us some specimens of them? It will be very interesting to know whether the species is the true Seventeen-year Cicada or some other species. * * * [August 31, 1888.]

Australian Letter on Icerya.

* * * The insect *Icerya purchasi* we have among our orange tribe, "Citrus," and if not frequently looked after I believe would spread to a great and damaging extent; but as we have so many other pests to contend with theone in question is kept down. Just a few days before the arrival of your note we had a regular clearing all around, and my overseer killed several dozen of the Icerya, of which this one mutilated specimen can be found now, which I send you in a little cotton wool, but I think enough of it for you to identify the thing. I have not seen it on the *Acacias*, but on other plants, and particularly on our native Currant Shrub (*Leptomeria acida* R. Br.), but as I am not just now able to see or procure specimens of the insect from that plant I could not be quite certain, although I believe so. If not the same species it is very much like it. I had several interviews on the insect with other horticultural and agricultural reporters and practical men, from which I submit the following, viz, that the sugar planters first noticed the Icerya on sugar-cane imported from Singapore, but I have known it on the Citrus, especially young plants, this sixteen or eighteen years myself. * * *—[Carl H. Hartmann, Range Nursery, Toowoomba, Queensland, Australia, March 20, 1887.

NOTES.

A DESTRUCTIVE CRICKET IN LOUISIANA.

A rather remarkable insect pest has come to light the present season in Catahoula Parish, La. It is a true cricket of the genus *Gryllus*, but the specimens so far received have been too badly damaged for specific determination. Mr. Michael Dempsey, of Jena, writing under date of May 7, says: * * * "They infest portions of the hills and swamp lands alike, doing irreparable damage to cotton, sweet and Irish potatoes, peas, and tobacco. * * * Our farmers are seriously alarmed at their fearful increase and their destructive habits. Their holes in the ground are promiscuously scattered from a few inches to several feet apart, and are seldom over a foot deep in the uplands, although they go much deeper in the swamp lands, as the soil is deeper and the subsoil softer. They are seldom visible in the heat of the day, and do their cutting at night, taking all they want down into the ground, where they eat as they please. * * * In 1852 I first

noticed them eating young cotton only, and a few years back they began to eat sweet potatoes. Now they eat peas and tobacco, and have attacked our gardens. Our parish is composed of small farmers who lack means. * * * We find that rapid cultivation, large gangs of poultry, and numerous birds keep them in check, but they are becoming too numerous in spite of all we can do."

Beyond doubt in a case like this the best remedy will be found in the use of a poisoned bait, and I have no doubt but that the bran, sugar, and arsenic wash, which proved so effective against the Devastating Locust in California in 1885, and which is described in my annual report for that year (Report Department of Agriculture for 1885, page 300), would prove attractive to the crickets and would accomplish the destruction of large numbers.

This mixture is usually prepared in wash-tubs or half-barrels. One of them is filled about three-fourths full of dry bran, and to this is added about 5 pounds of arsenic, which is thoroughly stirred through bran with a spade or shovel. Five pounds of sugar is next thrown into a pail, which is then filled with water, and the sugar stirred until it is dissolved, when this sugar water is added to the bran and arsenic and the three well stirred; more water is added and the stirring continued until every portion of the wash becomes thoroughly saturated. This should be placed about the infested fields in table-spoonfuls.

Freshly cut grass or other green vegetation, sprinkled with Paris green or London purple and scattered at intervals throughout the fields, will also produce good results, and be less expensive. (C. V. Riley, in *Florida Dispatch*, June 20, 1887, vol. 7, p. 576.)

A NEW ENEMY TO HONEY BEES.

Several predaceous bugs have been recorded from time to time as feeding upon honey bees, and in Bulletin 12 of this Division (page 44) we mention the fact that the common Wheel Bug (*Prionidus cristatus*) was in the habit of lurking about the hives and preying upon the bees at Winchester, Va. Last summer we received information from Mr. J. W. Lanford, of Lawrence County, S. C., that another bug had been captured by him in the act of piercing the honey bee, and that his neighbors had noticed the same insect lurking about their hives. The specimen captured in the act was forwarded to us, and proved to be *Euthyrhynchus floridanus*, a species which is rather common throughout the South.

AN UNPUBLISHED HABIT OF ALLORHINA NITIDA.

To Mr. W. W. Meech, of Vineland, N. J., the well-known authority on quinces, is due the credit for the discovery that the ways of this common beetle are not altogether bad. He found the adult beetles eating the fungus *Ræstilia aurantiaca* upon his quince trees. They even alighted upon it in the basket when he was gathering the fungus and

ate it greedily. Mr. Meech says "for this meritorious service I desire they should have full credit as among the insects beneficial." This beneficial habit, however, is more than counterbalanced by their appetite for fruit, to say nothing of the damage done by the larva.

A NEW REMEDY AGAINST THE WOOLLY APPLE-LOUSE.

Maurice Maindron, in a summary of the habits of this insect, illustrated by a very handsome plate in the July number of the *Revue Horticole*, quotes the following formula from Dr. Cramoisy:

	Grams.
Pyroligneous acid rectified to 7 or 8 degrees	1,000
Salicilic acid	2
Red oxide of mercury	1
Fuchsine	.25

This solution is diluted with 30 parts of water when the vegetation is active, but is used pure in winter time. A month or two after the application of this caustic, according to Mr. Künckel d'Herculais, the old epidermis of the tree on which the eggs are found falls in powder and the bark becomes smooth, shining, and of a beautiful mahogany color.

OVIPOSITION OF THE PLUM GOUGER.

Regarding the egg-laying habits of the Wild-Plum Weevil or Plum Gouger, *Coccotorus scutellaris* [*Anthonomus prunicida* Walsh], shown at Fig. 12, while they have been described (see Walsh, First Rep. Ins. of Illinois, pp. 72–78; Riley, Third Rep. Ins., Mo., pp. 39–42), the following confirmation will prove interesting. Mr. Lawrence Bruner writes us from West Point, Nebr., under date of June 16, 1888: "I have just witnessed a female specimen of the Wild-Plum Weevil in the act of depositing an egg. The modus operandi is very simple, and requires but a minute and a half to two minutes for the performance of the entire operation. She first spreads out to their fullest extent all of her legs, braces them, and then draws her beak or rostrum to as nearly a perpendicular position as possible, then by gnawing and with a twisting motion soon works her snout into the young fruit until it is buried a trifle above the bases of the antennæ, the latter being held close against and directed upward along the rostrum upon the head while the hole is being made. She now draws out her beak and deliberately turns about, and after a few preliminary thrusts of the ovipositor inserts the latter into the hole just made with the beak and deposits a single egg that is of the same diameter as the puncture. The egg is of a dirty whitish, somewhat transparent color, and is plainly visible with an ordinary pocket lens, being uncovered and nearly flush with the surface. It soon becomes covered by the healing of the injured fruit. This curculionid does not make the semi-

FIG. 12.—Coccotorus scuttellaris. (After Riley.)

circular or lunate gash that is so characteristic of the "little Turk." It deposits a single egg in each plum attacked. But some plums examined were found to contain several eggs, several weevils having no doubt used the same plum for oviposition. When the egg has hatched and the young grub commences to bore into the fruit, a transparent, gummy substance oozes from the puncture. Fruit containing the grubs of this weevil does not necessarily fall prematurely, nor does it appear to be greatly injured for use. The mature insects from the new brood begin emerging by the time fruit commences ripening, and from that time on to late in the fall. They winter in the ground and in various sheltered localities about plum patches. In spring they appear with the first buds and blossoms, and can be jarred from the trees like their ally, the "little Turk." They cling more tightly, however, than that insect does, and a much severer jarring is required to dislodge them. Their puncturing, while not so marked as that of the other insect, begins just a very little earlier and continues perhaps somewhat later in summer."

RECENT SWARMINGS OF INSECTS.

The Reading (Pa.) *Times* for August 2, 1888, contains an account of an appearance of "bugs" in that place, with detailed remarks by a local savant (Prof. G. H. Thompson), who stated that the insects in question were "a species of a cotton bat, usually called the moth," and that "it comes from the cotton fields of the South." Who this professor is we do not know, but it is clear he is not familiar with the subject he tries to discuss. In a letter from Herman Strecker we are informed that the moth which appeared in such large numbers for the one night, August 1, was a Tortrix (*Tortrix fractivittana* Clem.). He also states that the article above referred to was on the authority of a fire-escape or lightning-rod man, who, to use Mr. Strecker's words, knew about as much of such things as an intelligent cow. The case is more correctly stated in the Reading (Pa.) *Evening Telegram* for August 2, 1888, some of the information therein being derived from Mr. Strecker himself. He also adds in his letter that "the next evening but a few were about and subsequently scarcely any." The sudden abundance of this Tortricid is certainly very extraordinary. It fluttered about the electric lights by thousands. According to a note in the Scientific American for August 18, 1888, they were first noticed flying around the lights about 8 o'clock. They soon infested the air to such an extent as to resemble at a distance a snow-storm, and passengers on the street-cars, as they passed under the lamps, were covered with the insects, which caused vast annoyance by getting into their ears, eyes, and mouths.

In the same number of the same journal Mr. Thomas Latham is responsible for the statement that myriads of moths were at date of his writing circulating around the electric lights upon Third avenue, New York. The note does not give the species, but states that the moths are barely half an inch long.

In the same number as above quoted, it is also stated that at Easton, Pa., "butterflies" by the thousands, after flying about the sixty-four electric lights, alighted on the carbons and fell dead inside the globes, two quarts of dead "butterflies" on an average being afterwards taken from each globe. It is quite possible that in this and the preceding instance the insects were the Tortrix first mentioned.

The *Rural New Yorker* for July 7, 1888, states that the Rose Beetle (*Macrodactylus subspinosus*) suddenly appeared the week previous in swarms at the Rural Grounds, causing a great deal of damage to grapes, roses, and magnolias. They were successfully combated by spraying with a Buhach solution.

AN INEXPERT DEFENSE.

The following clipping is from the Manchester (Eng.) *Courier* for July 7, 1888, and is entitled: "A remarkable charge of homicide:"

PARIS, *Thursday Night.*

The trial begins at Lyons to-morrow of M. de Villenuve, charged with homicide. M. de Villenuve is a wine-grower. Early this year eleven people died at Hyères and more than four hundred were suddenly taken ill with symptoms of poisoning. The corpses of the victims showed, at the post-mortem examination, poisoning by arsenic. M. de Villenuve, who had furnished them with wine, was charged with falsifying it with arsenic. His defense is that two years ago he employed that chemical to rid his vines of phylloxera. The insects were destroyed, but according to his theory the poison must have been absorbed by the vines, and thus poisoned the wine.

As a matter of course this defense is utterly inadmissible, and either the theory of the prosecution is correct, or an arsenical mixture must have been sprayed upon the vines at or near the time of ripening of the fruit, either as a remedy for some leaf-eating insect, or, as is more likely, for the grape-vine mildew, or perhaps for the black rot. It is not known to our chemists that arsenic is ever used as a falsifier of wine, but certain crude chemicals containing an appreciable quantity of the poison might be so used.

INSECT DAMAGE TO THE CORKS OF WINE BOTTLES.

At the monthly meeting of the Entomological Society of Belgium held May 7, 1887, Mr. Preudhomme de Borre presented a communication regarding insects which feed upon the corks of bottles in cellars, especially wine bottles. Different species eat holes through the corks, thereby causing the wines to escape. Two species (*Oenophila v-flavum* and *Rhizophagus bipustulatus*) were found in corks brought him from Burgundy. As a remedy he recommended the covering of the bottles with a hard and thick wax not subject to breaking or cracking. His closing words were: "For the love of the god Bacchus cover your bottles well, then, gentlemen." While advising this remedy he had been disposed to believe that the eggs of the insects do not pre-exist in the corks, but Dr. Tosquinet, who engaged in the discussion, announced

that he had seen several of these corks in which the wax had been bored through by the *exit*-holes of a coleopterous insect. Thus in some cases the eggs may be deposited in the cork before it is used for the bottles and escape unhurt the processes of manufacture and corkage. To escape this the bark is to be disinfected after gathering. *Tinea cloacella*, *Endrosis lacteella*, *Asopia farinalis*, and *Oniscus murarius* (a Wood-louse) were also mentioned as cork-eaters. The last named attacks them probably only after they have first been attacked by insects. The idea of substituting rubber corks for bark ones was brought up but not favored, because the rubber would be apt to spoil the flavor of the wine.

LOCUSTS IN ALGERIA.

According to the *Revue Horticole* for July, 1888, the locusts are doing their principal damage in Algeria the present year in the province of Constantine. It is too early to estimate the extent of the injury, but it is said to be immense. The Government has appropriated the sum of 500,000 francs, principally as a bounty, to the most meritorious farmers. Editorially the journal goes on to say: "This is very good, but what will be equally useful is the appointing of a commission composed of distinguished entomologists and agriculturists who will study this scourge from its origin and will seek the means, if such exist, of preventing the return of these invasions."

ENEMIES OF ICERYA IN NEW ZEALAND.

In the July, 1888, number of the New Zealand Farmer a correspondent writes that he has been investigating the condition of *Icerya purchasi* in that country, and states that there is a very general impression in most districts that it has received a check from some cause not yet apparent, as the information in regard to what cause or causes can not be wholly relied upon. Another correspondent writes in the same number that he finds birds destroying this pest, gold-finches feeding constantly upon it, and paroquets being also known to eat it. In the June, 1888, number the New Zealand cuckoo is supposed to have destroyed large numbers of the scale. Vast numbers of the females on an acacia-hedge in Wairoa South were found destroyed by some natural enemy; the ova-sacs torn open, eggs gone, shreds of the cotton lying about on the ground and no larvæ to be seen, everything pointing to a bird as having been the benefactor. The evidence seemed to be in favor of the cuckoo just mentioned. This bird is said to be a visitor in New Zealand at certain seasons only, and is found in many warmer lands with a climate like that of southern California—in Australia, Tasmania, Java, and Sumatra. This matter is worth attention. Bird enemies, as well as insect enemies, should be considered when the question of introducing Icerya-destroyers into California is brought under investigation.

SPECIAL NOTES.

As will be seen from the Extracts from Correspondence, the Chinch Bug has been very severely affected by the epidemic diseases due to micro-organisms both in Minnesota and Illinois, and, as we may safely assume, in the intervening country. This, taken in connection with the rise in the price of wheat, must be very encouraging to the Western grain-growers.

Entomology would seem to have very little connection with those most interesting of modern inventions for speech recording and repeating, as exemplified in the phonograph and graphophone. But some composition having wax as a basis has so far proved to be the best for recording the impressions of the sound waves and also for reproducing them, and this fact must necessarily enhance the value of the wax product; for we have little doubt that this improved instrument will rapidly come into general use as a substitute for stenography.

We are very glad to learn that Prof. C. H. Fernald, of Amherst, Mass., has decided to monograph the Pyralidæ, one of the most interesting families of moths; because he is one of the few really careful and conscientious workers in descriptive and monographic Lepidopterology of which the United States can boast. He excludes the Phycitidæ because they are being especially worked up by E. L. Ragonot, of Paris, who has for years been preparing his plates and diagnoses and who is a careful and conscientious worker.

The last number of *Entomologica Americana*, the organ of the Brooklyn Entomological Society, comes to us with six pages of descriptions, by Geo. D. Hulst, of Epipaschiæ and Phycitidæ. In four of these pages some eighteen new genera are defined in characteristic manner, averaging three or four lines to each characterization. Most of the new generic terms are what may be called humbug names—*i. e.*, words selected at random or coined without reference to the peculiarities of the insect, and not in conformity with best custom. In none of these generic characteri-

zations is there any information to guide the student as to wherein the genera differ from allied genera. Having in the past described a number of species in similar manner and referred them provisionally and often wrongly to various genera, Mr. Hulst takes this method of cutting the Gordian knot and saving himself trouble by making many of them types of these new genera. Such work seems to us the merest child's play. It is unworthy the dignity of science and justifies to-day the well-known stigma which Latreille, in his day, applied to a certain class of Lepidopterists.

We want a couple of young men in the work of the Entomological Division. Qualifications: Some knowledge, or at least interest, in entomology, but particularly some chemical training and mechanical ingenuity. Ability to draw and some knowledge of French and German will add to the applicant's fitness. Any one seeking such a position should correspond with the Entomologist, stating qualifications and references.

Prof. Dr. K. Lindeman, of Moscow, writes us that the larva of *Plusia gamma* has been extremely prevalent and injurious the past summer in that portion of Russia, having, in seven environments, done great damage to Linseed, Peas, and Hemp.

THE PARSNIP WEB-WORM.

(*Depressaria heracliana* De G.)

By C. V. Riley.

SYNONYMY.

? *Phalæna-Tortrix* (*Ph.-Tinea*) *heracleana* Linn.
Phalæna-Tortrix heracliana De G.
Phalæna heraclei Retzius.
? *Tinea umbellella* Fab.
? *Pyralis umbellana* Fab.
? *Pyralis heracleana* Fab.
Tinea apiella Hübner.
Depressaria heraclei Haworth.
? *Depressaria umbellarum* Haworth.
Hæmylis daucella Bouché.
Depressaria heracleana Stephens.
Hæmylis pastinacella Duponchel.
Hæmylis umbellella Zetterstedt.
Depressaria pastinacella Zeller in litt.
Hæmilis pastinacella Bruand.
Depressaria ontariella Bethune.

The first specimen of this moth which we obtained was in 1875 from Mr. H. G. Hubbard, who had found the larva in the stem of some cruciferous plant, in slight brown open cocoon, and pupæ several together in same stem. In the summer of 1883, while spending some delightful hours with Mr. Roland Thaxter, of Kittery Point, Me., we found this insect extremely common in the stems of Wild Parsnips, of rank growth and exceptional size, everywhere growing about that point. Some of

the large hollow stems from an inch to two inches in diameter would have over a dozen larvæ or pupæ within them, but no larvæ were found at the time upon the umbels. Our next experience with this insect was in 1886 on Lord Walsingham's estate at Merton Hall, Thetford, England. Here the larva was chiefly working on the umbels. We brought over with us for comparison specimens of the larvæ and imagos, and find the specimens absolutely identical with those from this country. The English specimens may be said to be slightly smaller on the average than the American, but from a series of fifty-two bred specimens now before us there is every variation between the extremes, the alar expanse ranging from 21^{mm} to 28^{mm}. On the average the American specimens are somewhat darker or more fuscous, but among them are a number fully as pale as the palest English specimens. We had placed *Depressaria grotella** Robinson as a variety of this species after a study of his figure and description, but Professor Fernald, who has a specimen of *grotella*, writes us that he believes the two are distinct.

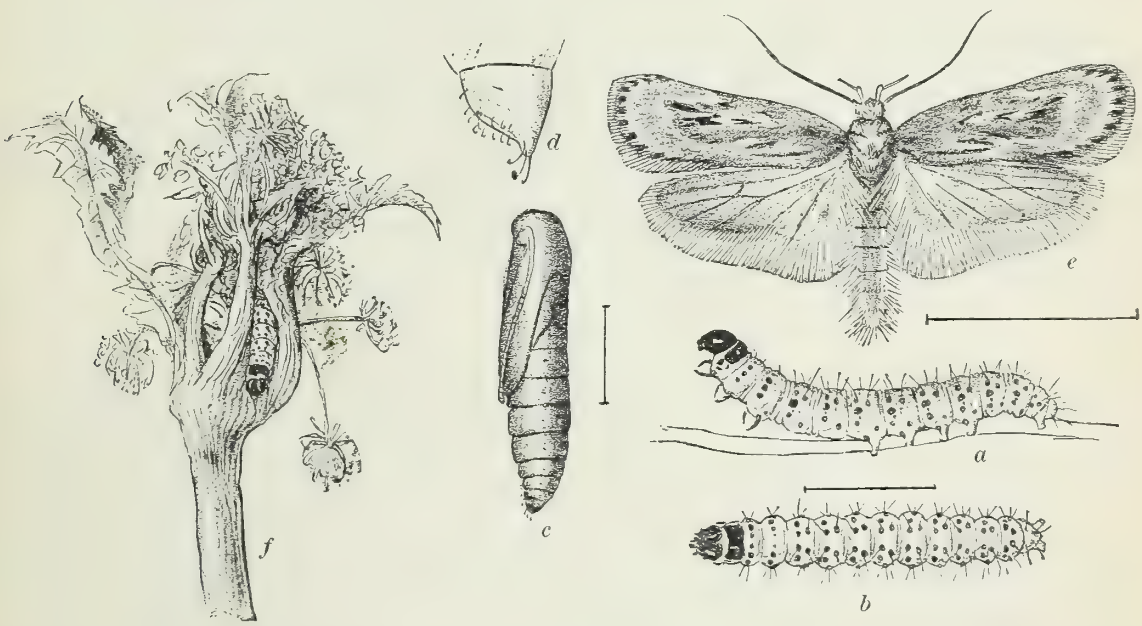

FIG. 13.—DEPRESSARIA HERACLIANA.—*a*, larva, side view; *b*, dorsal view; *c*, pupa; *d*, anal extremity of pupa showing hooks; *e*, moth—enlarged; *f*, umbel of parsnip webbed together by the larvæ, natural size (original).

EARLIER LITERATURE.

The first reliable description of the species is that given by De Geer, and must be considered the original characterization, as that of Linnaeus is very uncertain. The descriptions of Fabricius are also uncertain, and are questioned among the synonyms. Many subsequent authors have figured and described the species. Albin (1720) is said to have figured it, Reaumur (1736) imperfectly figured larva and moth, DeGeer (1752), Shäffer (1758), Hübner (1805–24), Duponchel (1836), Herrich-Shäffer (1855), and Zeller (1854) have figured the wings, while J. Sepp (1843) has given an excellent plate of all stages excepting the egg. Bruand

* Lepidopt. Miscellanies. Ann. Lyc. Nat. Hist. N. Y., vol. 9, 1870, pp. 157, 158, pl. 1, *f*, 10.

(1844) figures larva and pupa, Curtis (1860) figures larva and pupa, and Stainton (1861) figures larva and adult.

THE SPECIES IMPORTED FROM EUROPE.

The Rev. C. J. S. Bethune (Can. Entom., vol. 2, No. 1, Aug., 1869, pp. 1–4) describes specimens taken in Ontario as *Depressaria ontariella* n. sp. On p. 19 of the same volume, in connection with a note on the subject by Mr. James Angus, of West Farms, N. Y., some doubt is expressed as to the validity of the new species. In his Beiträg. z. Kennt. d. nordam. Nachtfalter, Zeller (Verhandl. d. zool.-bot. Gesellschaft in Wien, Band 23, 1873, pp. 235–236) refers to two females under the name of *ontariella* Bethune (hence, of course, from Canada or the United States), one having label "14 Aug.," received through Dr. Speyer, which agreed in the most exact manner with large European specimens of *heracliana*. Zeller adds that without doubt the species emigrated to America; and having reached land after a happy winter passage experienced no difficulty in selecting at once a suitable food-plant for its progeny. Soon after this Prof. J. A. Lintner (Canad. Entom., vol. 5, p. 82) records that a specimen of *D. ontariella* Bethune, sent by him the previous fall to Dr. Speyer, and by him submitted to Zeller, was by the latter determined to be *D. heracliana*. We have also from William Saunders, now director of the Dominion Experimental Farms, an authoritative specimen of *ontariella* which is a true *heracliana*.

HABITS AND NATURAL HISTORY.

Stainton says that the eggs are deposited in the spring by the hybernated female moth upon the undeveloped umbels of the Parsnip (*Pastinaca sativa*). The larvæ may be found here in the United States in the month of June; in England toward the last of June and through July. They web the flower-heads together until these are contracted into masses of web and excrement, an umbel thus affected being shown in fig. 13, *f*. After the larvæ have consumed the flowers and unripe seeds and become nearly full grown, they enter the hollow stems of the plants by burrowing their way inside, generally at the axils of the leaves, and then feed upon the soft white lining of the interior. Here, inside the hollow stem, they change to the pupa state. The larvæ are moderately gregarious. They will sometimes eat newly-sown parsnip, after the older plants originally attacked have been destroyed, in such cases eating the tender green leaves, while of the older plants they eat only the flower-heads and interior lining of the stems. It is not at present known whether there are two broods, though this is quite probable.

On June 4 of the present year we received from the noted seedsmen D. Landreth & Sons, Bristol, Pa., flower-heads of the parsnip badly infested with the larvæ, accompanied by the following account of injury:

We send you some further specimens of parsnip seed-stalks suffering under the attack of the grub referred to in our previous letter.

This larva, if it attacked only the extended foot-stalks of the seed-heads might be treated, but it secretes itself as well within all the folds and enveloped spaces of the seed-stalk, parts that can not be reached except by unfolding.

We have treated the affected plants with kerosene emulsion, whale-oil soap, dry Paris green, Paris green in water, per-oxide of silicate, and other articles, and all to no effect.

No parsnips being at hand to feed the larvæ upon, a lot of flower-heads of the Wild Carrot (*Daucus carota*) were placed in the breeding cage with them. After a short interval large numbers of the larvæ gathered around the cut ends of the stems and began feeding thereon. They were noticed, also, to be cannibalistic in their habits, several being seen to attack one of their number and devour it in a very short time. They did not like the flowers of the Carrot, but bored into the stems. On the 15th of June more larvæ were received, the umbels infested by them being completely spun together so that they could not expand, and the greater part having become brown and decayed. In a few instances the larvæ had entered the stem.

On the 14th of June a few of the larvæ changed to pupæ in the midst of large masses of excrement. On the 18th about a dozen more pupated, some at the bottom of the jar and others on the flower-heads or any other part of the plant, while others still pupated between the folds of blotting-paper placed purposely at the bottom of the jar; all inclosed in a slight web. On examining the stems of the Carrot, July 12, on which they had fed, it was found that several had entered to undergo their transformations.

According to Bethune the species remains from 11 days to 2 weeks in the pupa state, in Canada beginning to appear about the 1st of August. Stainton gives the length of time passed in the pupa state in England as 3 to 4 weeks.

The moths which we reared in 1883 issued between July 30 and August 4; those from Mr. Landreth the present year issued from June 25 to July 10. They have the habit of creeping into the crevices of the soil, and are then not easily detected.

DESCRIPTIVE.

De Geer first described both the larva and the moth in part 1, volume 2, of the Mémoires. A brief but good description of both is also given by Stainton in the Tineina, while Bethune has fully described the larva, pupa, and imago under the name of *ontariella*.

No description of the egg of this species has been published, and we have not yet obtained specimens.

The larva (Fig. 13, *a* and *b*) varies in general color from a light yellowish or greenish to a bluish-gray, and has conspicuous black piliferous spots normally placed, the head and cervical shield being black. Its average length when full grown is 12 millimeters.

The pupa (Fig. 13, *c*) is dark brown, unarmed and normal, and is inclosed in a slight silken cocoon inside the hollow stem of the plant.

The moth (Fig. 13, *e*) is of a grayish-buff or pale ochreous, with fuscous markings on front wings.

GEOGRAPHICAL DISTRIBUTION.

This species is probably one of the most generally distributed of the genus. It is recorded by Herrich-Schäffer from Glogau, Dresden, Sweden, and England. Stainton adds Scotland, Ireland, France, Finland, and Canada. It is also now well seated in the Eastern United States.

FOOD PLANTS.

In Europe, the Cow Parsnip (*Heracleum sphondylium*), Cultivated Parsnip (*Pastinaca sativa*), Siberian Parsnip (*Heracleum sibiricum*); in America, *Pastinaca sativa* and the Wild Carrot (*Daucus carota*) are known to be subject to its attacks.

ENEMIES.

Kaltenbach (Pflanzenfeinde, p. 282) says that according to Boie, of Kiel, its natural enemies are *Cryptus flagitator* Grv., *Pimpla heraclei*, and *Hoplismenus dimidiatus*, which he found in the roots, together with the pupa cases of the moth. Curtis (Farm Insects, p. 414) records *Cryptus* (*Phygadeuon*) *profligator* Grv., and *Ophion* (*Pristomerus*) *vulnerator* Grv. as bred from the larvæ by Bouché. He also records his own breeding, from a single larva taken from the parsnip, of a female *Microgaster* allied to *lacteipennis*, and about thirty females of *Encyrtus truncatellus*, which he believes were parasitic on the *Microgaster*. In this conclusion he is doubtless in error, as *Encyrtus truncatellus* (=*Copidosoma truncatellum* Dalm.) is always, so far as known, a primary parasite of Lepidopterous larvæ. It already inhabits this country, and may probably turn up as a parasite of this particular Depressaria.

No parasites were bred by Bethune in this country, nor by us. Among the birds, however, Bethune states that the Hairy Woodpecker, (*Picus villosus*) visited the parsnip-stalks in his garden daily, and pecked away at the larvæ and pupæ within.

REMEDIES.

Bethune suggests as a remedy that, when the young caterpillars appear on the flowers, the umbels may be dusted over with powdered white hellebore, repeating the operation occasionally. We doubt the efficacy of this, and should have more faith in the arsenites, notwithstanding Mr. Landreth's adverse experience. Should the flowers be destroyed before they are noticed, cut off and burn all affected stalks before the moths emerge from the pupæ. The larvæ are easily disturbed, and may be dislodged from the umbels and collected in pans and burned.

NOTES ON A SIMULIUM COMMON AT ITHACA, N. Y.*

By L. O. Howard.

Prof. J. H. Comstock has been studying for some time a Black Fly which occurs in its earlier stages in enormous numbers in and about the streams at the head of Cayuga Lake, and which may or may not be identical with the species studied by Dr. W. S. Barnard, and which he treated in 1880 in the third volume of the American Entomologist. I am of of the opinion that it will prove to differ on account of differences in the manner of oviposition. Dr. Barnard's species was studied at Buttermilk Creek, 3 miles south of Ithaca, while the species observed by Professor Comstock inhabits the Cascadilla and Ithaca gorges, both of which are on the north side of the city.

As a boy I was familiar with the large black slimy masses of larvæ attached to the rocky bottom of the Cascadilla, as, indeed, what Ithaca boy was not. We all avoided them as if they had been poisonous, and called them "Blood-suckers," and every one of us firmly believed that he would be a "goner" if he accidentally stepped upon a clump while bathing. Their true nature was not known until well along in the seventies, when Professor Comstock discovered their real affinities. The old name and the old superstition, however, still clings to them among the youthful bathers in these streams.

To-day (September 2, 1888) I have just taken a walk through the Ithaca gorge in company with Professor Comstock and have been much interested in observing these insects after having studied *Simulium venustum* at Washington, and being familiar with the collected specimens, in all stages, of *S. meridionale* and *S. pecuarum* studied by Professor Riley from Arkansas and Mississippi, and described by him in his 1886 report. There had evidently been a comparatively sudden fall in the water, and we were enabled to make our observations dry shod. Many patches of larvæ were left high and dry, and were wriggling and dying, in glistening masses, under the hot rays of the sun. The bottom of the stream is solid rock into which many small pot-holes have been worn, and some of these holes were still filled with water, making miniature aquaria, which seemed teeming with animal life like the tide pools on the sea-coast. Simulium larvæ of all sizes were found in these pools, and with them the larvæ of Ephemerids, of *Sialis*, of *Hydropsyche*, and others which we did not recognize. One large green Phryganid larva, with two tripartite anal hooked processes was observed destroying one of the Simulium larvæ.

* This article was sent in as a field note while making a brief sojourn at Ithaca, with the hope that it would arrive in time for the September number. It was too late, however, and is published in this number without further elaboration, which would take more time than I can just now spare.—L. O. H.

The full-grown larvæ of the Simulium are the largest I have ever seen. Specimens were taken which were afterwards measured and found to be between three-fourths and seven-eighths of an inch long. The anal swelling is very pronounced. Those colonies which were left by the receding water seemed to make no effort to escape but probably died on the spot to which they were attached. A gradation in the size of the larvæ from the borders of the stream to the center was observed, as already noticed by Dr. Barnard. The cocoons were found here and there, but apparently usually a little distance away from the masses of larvæ. The cocoons appeared to me exceptionally large and tough. The colonies of larvæ were found in greatest numbers just on the verge of the numerous falls where the water was shallow and swift, and at the crown of these falls I was delighted to have Professor Comstock point out to me the adult insects. They were hovering in the bright sunlight in considerable numbers, and a number were captured with a net. They could hardly be said to fly in swarms, but seemed to hover about, each one independent of the others, but remaining in about the same locality. At this time of the year they seemed to be principally males, as of the fifty specimens captured but one was a female.

Professor Comstock tells me that this same flight of the adults can be observed on almost any day through the summer, and that he has seen them as early as June. During July he states that he observed them flying in enormous numbers. His notes upon the oviposition of the species will be very interesting when published. It will be remembered that Dr. Barnard observed the eggs at Buttermilk ravine at the edge of the steam *above the water.* Professor Comstock, however, has seen the female dart at the crown of the falls after a preliminary hover and lay her eggs in the swift current. He states that a number of females choose the same place for oviposition and frequently lay a mass of eggs as large as the palm of one's hand, which accounts for the large extent of the colonies of larvæ. I have seen these larvæ in patches of many feet in length and so close to each other that the surface of the rock could not be seen. The jet black color of the larvæ is striking, and the colonies can be readily seen from a considerable distance.

A peculiar fact concerning this species is that it *does not seem to bite.* No one, so far as I know, has ever been bitten by a Black Fly in this vicinity. A comparative examination of the mouth-parts of this and other species will therefore be interesting. The males are very beautiful, as are individuals of this sex in other species of the genus. The eyes in life are of a beautiful golden bronze, the body is covered with a silvery pubescence and the wings are highly iridescent.

The exact details of the life history of this species are being collected by Professor Comstock, and we look forward to their publication with much interest.

I called attention three years ago to the abundance of the nets and tubes of *Hydropsyche* upon the Simulium-covered rocks in Rock Creek

at Washington, and I was pleased to find the same condition of affairs here at Ithaca. The cases of these carnivorous larvæ were very numerous, as was to be expected from the abundance of food. The nets differed from those found at Washington and the species is probably different.

A LADY-BIRD PARASITE.

By C. V. Riley.

Up to the present time no parasites of adult Coccinellidæ have been recorded in this country, although *Homalotylus obscurus* Howard has been reared from the larvæ of the Convergent Lady-bird (*Hippodamia convergens*) in Florida by Mr. H. G. Hubbard.* European entomologists, however, have recorded several observations of this character, and we have long known of the occurrence of at least one parasite in the United States (the species here treated) having habits similar to those described by Westwood, Ratzeburg, and others.

In 1879, at North Bend, Ohio, while visiting our esteemed friend, the late Dr. John A. Warder, we found one specimen of the Spotted Ladybird (*Megilla maculata*), stationed almost motionless, though still alive, over a tough brown silken cocoon in the position shown at Fig. 14. We had previously, in Missouri, found the same Coccinellid dead and fastened in a similar manner over an empty cocoon, but looking so natural that until dissected and found to be gutted, it was difficult to realize that it had been parasitized. No flies were obtained from the specimens.

Fig. 14.—Megilla maculata. Beetle and cocoon of parasite, enlarged (original).

In July, 1883, according to our notes, Mr. Howard observed the same thing at Sheldrake, N. Y., but made the mistake of attempting to observe it from day to day in the field without disturbing it, and one day the leaf of corn to which the specimen was attached was missing. In 1884 a number of similar specimens were found at Washington by Mr. Pergande, and at Oxford, Ind., by Mr. Webster, and these were carefully studied and a number of the adult parasites reared.

The cocoons and the parasitized beetles were found upon a number of different plants, but usually upon cereals. The beetles in all these later cases were at first alive, and several of them lived for twelve days after they were found. All were unable to leave the cocoons, and when forcibly detached were unable to walk, rolling over upon their backs on making the attempt. The closest examination of the beetles found attached to the cocoons failed to show any exit-hole by which the

* See Bull. 5, Division of Entomology, p. 22, and Insects affecting the Orange, Hubbard, p. 70.

parasitic larva emerged prior to spinning, although it seemed probable that the ventral portion of the thoracico-abdominal suture was used for this purpose. Mr. William H. Patton, who has also found this parasite on *Megilla maculata*, informed us in 1881 that in his specimen the larva had apparently emerged form a perforation in the last dorsal segment of the abdomen.

A number of free specimens of the Spotted Lady-bird were captured August 24, for purposes of comparison, and in one individual which could not be distinguished from the others in size, coloration, *or activity* was found a larva which was with little doubt that of the same parasite. This larva was apparently full-grown, as it filled the cavity of the abdomen completely. Its head was directed towards the suture between the abdomen and the metathorax, thus strengthening the probability that this is the point of exit.

In addition to the numerous specimens of *Megilla maculata* found thus parasitized at Washington, one specimen of *Coccinella 9-punctata* was also found which had evidently been infested by the same parasite.

Mr. Webster's observations and his efforts, at our request, to ascertain the point of exit of the parasitic larva from the beetle are summed up in a letter dated Oxford, Ind., July 22, 1884, and from which we quote:

> I am sorry to say that with my present knowledge I am unable to settle the Lady-bird parasite matter to my satisfaction. I have had five examples, only one of which (*a*) was placed in alcohol when found. This had sufficient vitality left to tear itself from the meshes of the cocoon. From this I think the parasite escaped by way of the aperture in the membrane connecting the thorax with the abdomen, which you can readily see. Three of the others were dried and difficult to study, none, however, exhibiting the aperture as in (*a*). In one the mouth was seriously damaged; in the other two not. These two were very brittle and, although there were apertures above in the vicinity of the scutellum and bases of the wings, I do not like to attribute to the parasite what might have been done by Webster.

The adult insect was bred in some numbers both from Washington and from Indiana specimens. Only females, however, were reared. No observations have yet been made on the mode of oviposition. Reference to the literature of European parasites of Coccinellidæ shows that the so-called *Microctonus terminatus* (Nees) has precisely similar habits, and under the supposition that the American species might be a *Microctonus*, specimens were sent to Mr. E. A. Fitch, of England, through Mr. J. B. Bridgman, for comparison with identified species in England. Through an oversight, Mr. Fitch did not notice that the species did not belong to *Microctonus*, and very naturally answered Mr. Bridgman that it did not correspond with any of Ruthe's types of this genus.

Subsequent study indicates that the species bred by us may probably be placed in the Braconid genus *Centistes* of Haliday, judging from Haliday's original description and the few words of analytic diagnosis contributed by Rev. T. A. Marshall to Mr. Cresson's synopsis of the Hymenoptera of North America.

Awaiting the forthcoming consideration of this genus in Mr. Marshall's Monograph of the British Braconidæ, however, we shall not attempt its characterization at present, but would simply propose for it the provisional name of *Centistes americana.*

The so-called *Microctonus terminatus* reared by Audouin, Ratzeburg, and Scheffer from Coccinella spp. proves, likewise, to be no *Microctonus* but to belong to the well-known genus *Perilitus.* (See Kirchner's Catalogus Hymenopterorum Europæ, and Marshall's Monogr. Brit., Bracon., Trans. Lond. Ent. Soc. 1887, Part II, p. 53.)

The parasitic habits of *Microctonus* proper are not known. All of the subfamily of the Braconidæ Polymorphi to which it belongs, viz, the Euphorinæ, are however, Coleopterous parasites in Europe so far as known.

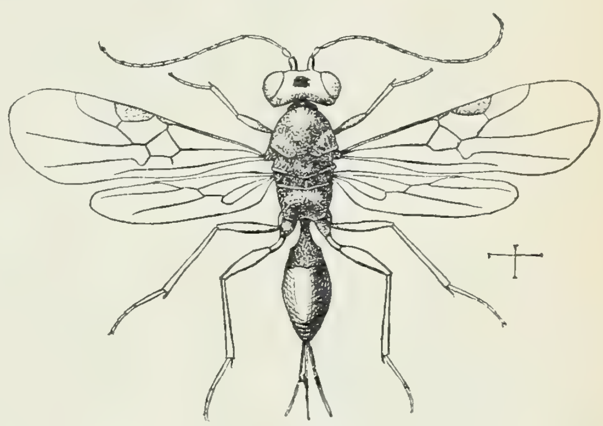

FIG. 15.—CENTISTES AMERICANA. Imago, enlarged (original).

Ratzeburg's interesting account of the habits of *P. terminatus* (Nees) indicates that it works in a manner almost precisely similar to our American parasite and we therefore print a translation of his account:

In 1850 I bred three females, all being found in very strange situations in the vicinity of Neustadt: Living specimens of Coccinella 5-punctata, and C. 7-punctata were sitting or hanging (once in a rolled-up leaf) on shrubs and carried under the abdomen a gray, pear-shaped, subtransparent cocoon surrounded with loose silken threads. From the fact that the Coccinella clasped the cocoon with the legs and got thus entangled in the silk, the cocoon was closely applied to the abdomen, and I had some trouble in detaching the cocoon when the Ichneumons (from June 10-14) had hatched after cutting open the cocoon. Two Coccinellæ were still alive as long as the cocoon was still unopened, since they moved their legs a little, but died after the Ichneumon flies had issued. The third specimen, however, remained living for a long time afterwards and even could place its legs into the proper position and remain standing. I have not been able to perceive the wound through which the Ichneumon larva issues from the beetle. However, the Microctonus larva surely feeds within the Coccinella (as already stated by Westwood) and it is probably through one of the ligaments, which later closes up again, that the larva pierces through the beetle. I come to this conclusion; first, I found upon dissection of a recently dead Coccinella that all intestines were shriveled up and pressed onto the walls; secondly, I have observed the sting by which the Ichneumon Fly deposits the egg.

To a lively female Microctonus, which I had kept alone for two days in a glass box, I placed a Coccinella 7-punctata. At once the attention of the Microctonus was aroused; she ran to the place where the Coccinella was and closely examined it from all sides, running forward and backward in a very comical way. Immediately afterwards she prepared to sting in the same way as described by me in Aphidius aphidivorus (I, p. 50). The abdomen, pear-shaped in repose, became long and thin; the ovipositor protruded more, only on the tip surrounded and conducted by the sheats. The sting was repeated about six to ten times in one minute and always directed against the incisures of the body (usually of the abdomen). Within one hour the female thus attacked three or four times the beetle, which only occasionally moved. Since the Ichneumon ♀ was not impregnated I could not expect to get any progeny.

In 1842 (June 10) I had already found one specimen pursuing a Coccinella. Wesmael also captured it in the middle of June and Nees in October (I, 30).

We have here also an Ichneumon Fly which oviposits in imagos, but imagos which are long-lived and in which the brood can mature (Westwood, Introd. II, p. 143, and Forstinsecten III, 18).

Within two days the Ichneumon Fly repeated its stings very often. It died then and shortly afterwards also the Coccinella.—[Ratzeburg, Ichneumonen d. Forstinsecten, Vol. III, pp. 61, 62.]

THE PURSLANE CATERPILLAR.

(Larva of *Copidryas gloveri*, Grote & Robinson.)

In August, 1879, we received larvæ of this insect from Columbus, Tex., where they were found by Mr. Schwarz in tolerable abundance feeding upon the common Purslane (*Portulaca oleracea*) in company with larvæ of *Deilephila lineata* which so commonly feeds upon this plant.

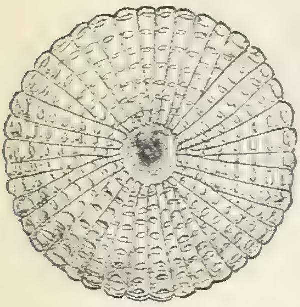

FIG. 16.—COPIDRYAS GLOVERI. Egg, greatly enlarged.

We did not receive them again until the summer of 1887, when they were sent to us by several correspondents in Kansas and Nebraska, who stated that they occurred in such great numbers upon the Purslane that they could not but anticipate great damage to field crops after the original food-plant should give out. As a sample communication we may quote from Mr. H. W. Lipp, of Rossville, Kans., who wrote us under date of August 22:

"Inclosed please find a few larvæ, and if not asking too much will you be kind enough to inform me to what order and family they belong? They have appeared here for the first time, and do no damage to crops just now. * * * Up to date they are feeding on purslane and nothing else, and the oldest and largest ones are commencing to go into the ground. To all appearances they are going to stay with us, and for that reason I would like to know if they are liable to attack growing corn next spring or no . They are here in very large numbers and some alarm is felt as to what they will feed on next spring. * * *

FIG. 17.—COPIDRYAS GLOVERI. Newly-hatched larva, greatly enlarged.

We reared a number of adults in 1887, and had intended publishing an account of the insect that year, but Prof. E. A. Popenoe, of Manhattan, Kans., who had the advantage of being actually on the ground, published so good an article in the Kansas *Industrialist* for October 1, illustrated by figures drawn by Mr. C. L. Marlatt, that the immediate necessity was overcome, especially as Professor Popenoe's paper was quite widely quoted. The facts, however, should be put upon more permanent record and hence this note. The accompanying figures of larva and moth were engraved several years ago, while the figures of the egg, pupa, and cocoon are copied from Mr. Marlatt's figures.

The following facts concerning the life history of the species are condensed from our own notes and Prof. Popenoe's paper:

FIG. 18.—COPIDRYAS GLOVERI. Cocoon inclosing pupa, natural size.

The eggs (fig. 16) are laid on the under side of the purslane leaf, either singly or in clusters of from two to five. The larva hatches in two or three days (fig. 17 young larva), and is at first light green or yellowish green with darker shading across the middle of the body. In eight or nine days it attains full growth after having passed through four molts. The full-grown larva (fig. 20, *b*) is light gray or dull white with black dashes on the sides of each segment, and with the shadings of salmon pink.

The full-grown larvæ enter the ground for pupation, excavating a tubular burrow in the surface soil, gumming the lining and closing the opening with a thin layer of particles of soil (fig. 18). The pupa is shown at fig. 19 with the head and anal extremities enlarged. The insect remains in this state in the neighborhood of twelve days. The moth is shown at fig. 20, *a*, and the colors of the front wings are brownish-gray, with a creamy white streak, those of the hind wings buff with a blackish margin.

FIG. 19.—COPIDRYAS GLOVERI. Pupa, with head and anal extremities enlarged.

Four generations were traced by Professor Popenoe, but he does not report upon the method of hibernation.

Glover figures the female in his plate 85, fig. 34, and states that it was the only specimen in a small collection by Dr. Lincecum, of Texas. This formed the type of the species, and the male was then unknown.

There is little danger that this insect will ever transfer its attentions to any cultivated crop, although the cultivated *Portulaca grandiflora* may suffer in the future. The insect may be looked upon rather as beneficial, in that it destroys the noxious "Pussley," the supposed evil qualities of which Charles Dudley Warner has made so celebrated in his "My Summer in a Garden." Purslane is, however, not looked upon by our Western farmers as a particularly noxious weed, and following the locust ravages of 1875 it proved almost a godsend by its rapid development and value both as food for hogs and as a green manure when plowed under.

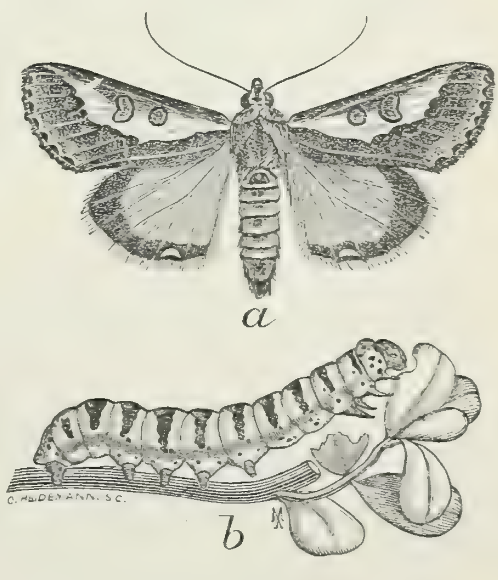

FIG. 20.—COPIDRYAS GLOVERI. *a*, adult; *b*, full-grown larva, natural size (original).

The species was originally described from the female (Tr. Am. Ent. Soc. II, 185) under the genus *Euscirrhopterus.* Subsequently Mr. Grote (*Can. Ent.* VIII, 99) referred it to *Copidryas*, and described the male from a specimen from Mr. Meske (now in our possession), separating the form from the Cuban *Euscirrhopterus freyi.* Butler (*Papilio* I, 129) compares the genus to *Ægocera*, but adds nothing to the description. Strecker (Lep. Rhop. et Het., 1877, 132) describes the larva from a blown specimen, and this is the first description of the larva made, though no food-plant is given. Of the seven specimens before us (4 ♀ ♀, 3 ♂ ♂) the males are uniformally smaller, and have the clypeal projection smaller and narrower, and covered with whitish, intermixed with a few blackish, scales, whereas in the female these scales are black. A second and less important character of the male is the tendency in the outer discal spot of primaries inferiorly to elongate and become double. The colorational differences mentioned by Grote have no sexual value.

FURTHER CONCERNING EXTERNAL SPIDER PARASITES.

By L. O. Howard.

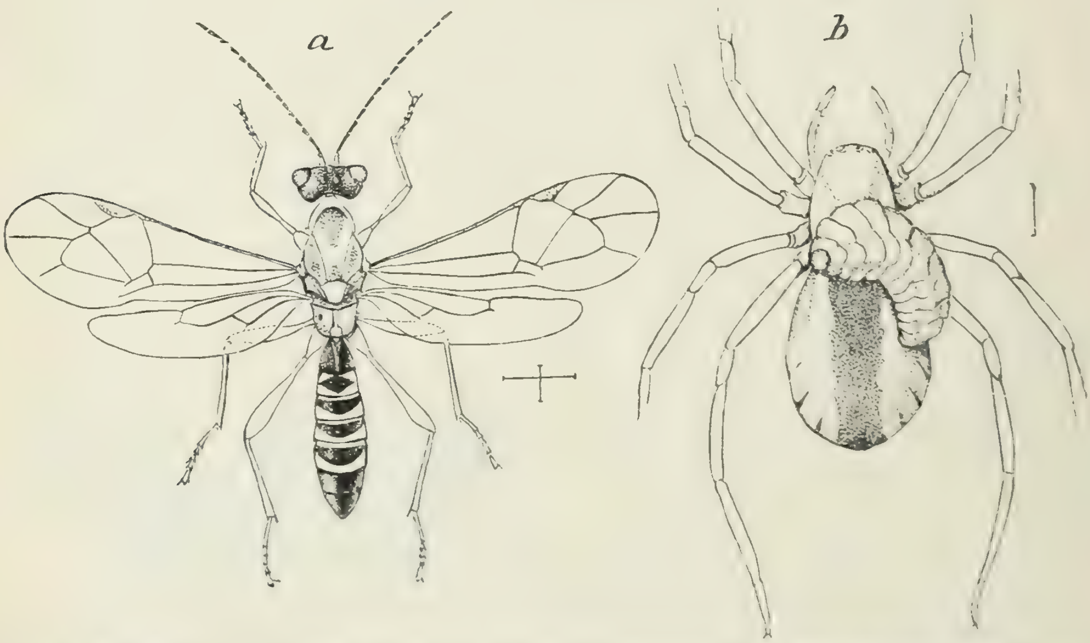

Fig. 21.—*a*, Polysphincta dictynæ, adult; *b*, Linyphia communis with its parasitic larva—enlarged (original).

After reading my note on this subject in the August number of Insect Life (p. 42), Mr. J. H. Emerton, of Cambridge, wrote me that he had sent me, among other hymenopterous parasites of spiders, several similar larvæ, and that he found such instances almost every year.

Upon looking over Mr. Emerton's material, which I had not previously carefully examined, I found five small spiders, four of which supported externally upon the dorsum of the abdomen parasitic larvæ and one a delicate cocoon from which a parasitic larva had been taken. The spiders seemed to be *Linyphia communis*, *L. marginata*, and a species of *Erigone.*

In another vial I was delighted to find an adult parasite, the cocoon from which it had emerged, and the remains of the spider which had supported it. Concerning this specimen, Mr. Emerton had made the following note:

Fly raised from larva on young *Dictyna volupis* Keys. The remains of the spider and the pupa cocoon are in the vial. When found, May 15, 1887, the larva was about half as long as the spider's abdomen and about one-fourth as thick. It was attached by the mouth on the front of the abdomen. By May 18 the spider had died and the larva was full grown, larger than the spider had been, and had begun to spin a cocoon. May 25 it changed to pupa and the fly came out June 1.

The adult parasite is a beautiful little *Polysphincta* ♂, and differs from other described North American species.

Polysphincta dictynæ n. sp.

Male.—Length, 2.5^{mm}. Face obscurely carinate below insertion of antennæ; mesonotum shining, but with short, fine, and close pubescence; metascutum with two submedian longitudinal carinæ extending parallel to the nucha when they diverge; nucha smooth, circular, rest of metascutum faintly shagreened. First abdominal segment with a well-marked smooth central longitudinal dorsal groove, sides of groove concave; venter of abdomen strongly concave; wing veins all light brown; no trace of an areolet. Color: Vertex and occiput black, face lemon yellow; antennal scape, pedicel, and joints 1 and 2 of funicle yellow, rest of funicle brown; mesothorax yellow with a large brown spot at front of scutum and one on each of the parapsides, also one just anterior to scuto-scutellar furrow; metathorax black; all legs yellow; abdomen honey-yellow below, segments 1, 6, and 7 brown above, remaining segments yellow, each with a definitely limited brown patch which is diamond-shaped on joint 2 and triangular on 3, 4, and 5.

1 ♂, from *Dictyna volupis;* J. H. Emerton, Cambridge, Mass.

The figures illustrating this note have been drawn by Miss Sullivan from the material received from Mr. Emerton. Fig. 21, *a*, represents the adult *Polysphincta dictynæ*, and Fig. 21, *b*, an outline drawing of *Linyphia communis* with a parasitic larva in situ. The larva figured is full grown and is quite apt to be that of the Polysphincta. No attempt has been made in this sketch to show more than the position which the parasitic larva assumes on the spider.

REMARKS ON THE HESSIAN FLY.*

At the meeting of the American Philosophical Society, May 4, the author called attention to some grave errors in the published minutes of the earlier meetings of the society. The public, as well as the most competent authors, had always believed that the Hessian Fly was introduced during the Revolution by Hessian troops. Dr. H. A. Hagen, of Cambridge, has argued against this belief. He has argued, further, that the species was not imported from Europe. Professor Riley showed that most of Hagen's arguments were weak and fell to the

* Abstract of a paper by C. V. Riley before the Society for the Promotion of Agricultural Science, Cleveland, Ohio, August 21, 1888.

ground, except that based on the early minutes of the Philosophical Society, which, as communicated to him (Hagen) by one of the secretaries, Mr. H. Phillips, jr., and as published, make mention of the Hessian Fly in 1768, or before any Hessian troops landed. Professor Riley announced that the statement of the secretary, as also the published minutes, turn out to be absolutely erroneous on these points, as, upon consulting the original records, he found no mention of Hessian Fly prior to 1791. In all previous cases *the Fly* or *the Fly in wheat*, or *the Fly-weavil* are the terms used, and it is susceptible of positive proof that these terms referred to totally distinct insects, belonging to different orders, and still called weevils, viz: *Sitophilus granarius*, *S. oryzæ*, and *Gelechia cerealella*. Thus popular belief and tradition are vindicated, but it is a most interesting illustration of grave and misleading error, resulting from inaccuracy in what appear to be trifles, as the change in the records was doubtless made inadvertently.

The following extract is from the letters to Dr. Hagen by Mr. Phillips:

At the request of Professor Lesley, I have examined our old minutes in reference to the Hessian Fly, and append on next page the results of my search. I know *positively* that before the Revolution our newspapers were full of communications in refence to the Hessian Fly *eo nomine*. I can not call to mind any one paper, but I remember perfectly frequently seeing these articles when reading for other purposes. I can not find that the committee ever reported.

The following are the extracts from the minutes as furnished by Mr. Phillips:

May 18, 1768.—Com. on Husbandry, to consider whether any method can be fallen upon for preventing the damage done to wheat by the Hessian Fly. [N. B.—Mr. Du Hamel has written on the subject.]

June 21, 1768.—Papers on the Hessian Fly read by Dr. Bond, ordered to be published. [See No. 4, original papers.]

October 18, 1768.—Col. Landon Carter, Sabine Hill, Virginia, observations on the Fly Weevil destructive to wheat; ordered to be published.

For purpose of comparison the following verbatim copy of the records is here reproduced:

May 18, 1768.—It was recommended to the Committee of Husbandry, etc., to meet on Tuesday, 31st of this month, at the college to consider whether any method can be fallen on for preventing the damage done to wheat by what is called the fly. [N. B.—Monsieur du Hamel has written on this subject.]

June 21, 1768.—The Committee for Husbandry report that they had considered ye affair of destroying the Fly in wheat, and that Dr. Bond had laid before them a paper containing many useful observations on that subject, which Dr. Bond was requested to read before ye Society. The Society having heard and approved of ye paper, request him to prepare it for ye press, that it may be communicated to ye public without loss of time.

November 15, 1768.—Colonel Lee transmitted to the Society the ingenious and accurate observation of Col. Landon Carter, of Sabine Hall, in Virginia, concerning the *Fly-weavil* that destroys the *wheat*. The Society acknowledge themselves under great obligations to Colonel Carter for communication of the conclusions he has formed (on long experience) concerning that insect's propagation and progress, and the methods to be used to prevent the destruction of the wheat by it, and order it to be printed for the public benefit.

EXTRACTS FROM CORRESPONDENCE.

A Stomoxys Injuring Stock in Oregon.

What is the name of this fly? It made its appearance here two or three years ago, and this year pesters our horses fearfully. Is there any application to the hide or coat of the horse that will keep them off?—[J. H. Albert, Salem, Oregon, June 29, 1888.

REPLY.— * * * This fly proves to be a species of the genus *Stomoxys*, and is so close to the Eastern species *calcitrans*, that I hardly care to separate them, especially as your specimen was flattened and broken. *S. calcitrans* is a well-known biting fly in the United States, seldom entering houses just before or during a rain, and its close resemblance to a common house-fly has given rise to the supposition that the house-fly bites only in wet weather. The species are seldom abundant enough to cause any injury to stock, although the present spring we have had accounts from Maryland and New Jersey of considerable annoyance caused to cattle by them. We have found that fish-oil is the most admirable preparation to protect stock from the bites of this fly and from the Buffalo Gnat. A reliable correspondent of ours states that in the absence of fish-oil he uses tallow with sufficient pine tar added to make it stick the hair together but not enough to make it cause the hair to fall off.—[July 10, 1888.]

The Colorado Potato-beetle in Nova Scotia.

* * * I wish to make known to your Department the interesting (not to farmers) fact that the Colorado potato-bug is now common in certain parts of Nova Scotia, in which province it became introduced about six years ago.

In this particular locality I visited in fields two days ago and found it covered with the young. Would you like specimens? I should be happy to forward them.—[J. Matthew Jones, Aylesford, Nova Scotia, July 14, 1888.

REPLY.— * * * Your statement in regard to the Colorado Potato-beetle is very interesting indeed as I believe we have no published record of this fact. We have for some time wished to secure specimens of this insect from its extreme northern range in order to make notes as to variation, and have also wished to receive notes from some good observer as to the life history in such localities, including particularly the number of broods, duration of the different stages, etc. * * * —[July 24, 1888.]

1888 Damage by Chinch Bug in Missouri.

* * * In your favor of July 2 is the query, "Are the Chinch Bugs really doing any damage in this vicinity, or have the rains killed them off?" They have and are doing considerable damage, but the excessive rains of this season have checked their multiplication considerably, I think, and also enabled the infested crops to make a strong growth and better resist the pumping operations of the insects. I am afraid yet as the weather gets drier and hotter that the maize and millet crops will be very much damaged. I was horrified yesterday to see the bugs swarming around the roots and stems of the grass in a timothy meadow. They were running back and forth over the ground like excited ants when their nests are disturbed.

Since writing the above I have been through some fields of maize, oats, sorghum cane, and millet, and the sight of the state of all these crops (though they were all doing well two weeks ago) was enough to "make the heart sick." It is hard to say which of the above crops has suffered already the most, though sorghum cane has been "cracked up" to be nearly bug-proof. The cause of all this quick devastation is apparently through there having been seven or eight days of hot, dry weather, which has enabled the bugs to "multiply and replenish the earth" and get in their work.

On the ground, running in a restless, excited manner among the roots of all the crops mentioned, the bugs are to be seen by thousands, as if they had been let loose on

the earth like a new Egyptian plague. They seem to be actuated by the same principle as "She," in Haggard's novel, and intend to "Blast" their way to success. If any one wishes to live here by farming the whole present system will have to be revised, a complete change of crops will have to be made. Clover and a variety of root crops will have to be grown. I did hope that by putting down most of our land in timothy meadows we might evade the bugs, but it seems now that they will damage timothy as bad as any other of the grass family; especially so would it be if the cereals and other grasses were not to be had.

The Chinch Bug is too prolific and omnivorous to be vanquished by any other mothod than starvation.—[J. G. Barlow, Cadet, Mo., July 9, 1888.

A problematical remedy against the Asparagus Beetle.

Asparagus beetle.—Last year I had very great numbers of them on my field. In October, after several killing frosts, I found hundreds of them on a few small plants which had escaped. All summer I fought them with Paris green. Being frightened by the great numbers seen as late as October, this spring I opened furrows on each side of the rows and placed a little more than half a ton of tobacco stems in those rows, closing them again with a plow. The two acres and one-third were disposed in four beds of twelve each, with a road 10 feet wide between every two beds, leaving for for the fifth bed only five rows. There was no tobacco placed in the roads. This spring I planted a row of asparagus in each road, as indicated by the larger dots. There was also an asparagus seed-bed from which I planted another 3½ acres with asparagus this spring. No tobacco was placed on the seed-bed. The place where the seed-bed had been is now a part of the new asparagus plantation. Several hundred plants which were not needed were heeled in about 50 paces away from the former seed-bed; most of them were sold, but some, perhaps fifty, remained, The plants with which those former roads were planted were, of course, taken from the seed-bed, where no tobacco had been used. The only places attacked by beetles this summer are those four roads, the space where the seed-bed had been, and the plants heeled in. Had I used tobacco on the seed-bed I think my plantation would have been entirely free from the beetle.

I had used tobacco in former years against the cut-worms which ate off the young shoots of my grapevines, by surrounding each plant with stems, dug in, with entire success. * * * —[G. A. Schmitt, P. O. box 156, Wellesley, Mass., July 11, 1888.

Increased ravages of Icerya in California.

During the latter part of last week and the early part of the present one I have been out to Pasadena and down to Orange, helping two different parties to get their fumigators in operation. The party at Orange told me that if he could not make a success of the gas he would cut down his trees, and several other orange-growers have told me the same thing in regard to their own trees. You have doubtless seen in the Pacific Rural Press that Mr. A. S. Chapman has resigned his position on the State Board of Horticulture, giving as his reason for so doing that the ravages of the Icerya had forced him to abandon fruit-growing. He and his father own what was once one of the finest orange and lemon groves in southern California, but is now almost worthless, owing to the ravages of the scale insects. A few weeks ago his father, Mr. A. B. Chapman, told me that he took what money his oranges and lemons brought him and spent it in spraying his trees with one of the best caustic washes in use, and as a result his trees were injured to such an extent that they will bear no fruit the present year, while the scale insects are about as numerous as before the spraying had been done.

Several other growers in the San Gabriel Valley told me that they were seriously thinking of abandoning their orange and lemon groves on account of the scale insects. It is getting to be a very serious question in this part of the State.—[D. W. Coquillett, Los Angeles, Cal., September 1, 1888.

The Green-Striped Maple Worm.

* * * For four years now our soft maples (*Acer rubrum*) have been defoliated by a disgusting worm, twice in a season ; and the vitality of the trees has been a good deal weakened. A more systematic warfare has been waged against them this spring than ever before, however, and the indications are that their numbers will be considerably reduced. I inclose a local item of mine in relation to them, and also some eggs.—[H. W. Young, publisher *Star and Kansan*, Independence, Kans., May 31, 1887.

REPLY. * * * The eggs which you send are those of the moth of the Green-striped Maple-worm (*Anisota rubicunda*). This insect is not treated in the pamphlet which I send you but was figured and described in Professor Riley's Fifth Annual Report on the Insects of Missouri. The newspaper clipping which you inclose as clipped from the *Star and Kansan* of May 27 is very sensible, and the remedy which is proposed is as good as anything which can be suggested. This hand-picking of the eggs is tedious but satisfactory when done thoroughly, and a spraying with London purple is also good where the apparatus is easily obtained. In the Missouri report just mentioned Dr. Riley recommends that a trench should be dug either around an individual tree or around the grove or belt. The trench should be at least a foot deep, with the outer wall slanting. Great numbers of the worms when about to leave the tree to transform will collect in this trench or bury themselves in the bottom, and may there be easily killed. The trouble with this remedy is that it destroys the worms after the damage has been done, but it will at the same time reduce the numbers of the next generation.—[June 9, 1887.]

Wheat Saw-Flies.

The accompanying bottle, contains a grub—found on my wheat. Last year, just before harvest, I found nearly one-half the stalks of wheat had lost their head, which I found lying on the ground just beneath the stalk, uneaten, and I could not imagine what had done the mischief. This year I watched more closely ; I discovered this fellow at work. Can you tell what he (or she) is?—[John S. Gittings, Baltimore, Md., June 6, 1887.

REPLY.— * * * The worm which is damaging your wheat is the larva of a Saw-fly, which has become quite abundant in the last two years in Ohio, Indiana, Pennsylvania, New Jersey, Delaware, and Maryland, confining its attacks to wheat and timothy grass. Up to two years ago none of these Saw-flies were known to possess this habit in this country, but this species now bids fair to become quite a pest. The life-history has not been fully made out as yet, and it will be very difficult to suggest a remedy at this time. An agent of the division stationed in Indiana is devoting his time to the study of insects affecting wheat and other grains, and he has been instructed to pay special attention to this insect. You will probably not be further bothered with them this season, as the majority of them will go in the ground to pupate within a few days. A topical remedy, applied to the worms in the field, is out of the question on a large scale, and we can only hope to bring about a destruction of the pupa or the adult insect. * * *—[June 7, 1887.]

* * * I have this morning, as per request, placed in a tin box a few worms, with food ; hope they will be received in better order. The fly to which you refer I noticed in large numbers on the wheat some two weeks since. They were larger than the common house-fly, and I think a bluish appearance. I inclose in the box some heads of wheat as I find them on the ground. They are working vigorously now. They do not maliciously cut off the head ; it is for the purpose of the better opportunity to sap the stem or eat the stem. They are vigorous feeders, and if their numbers were great would destroy the entire crop; they are evidently increasing; more numerous than last year. They can cut a head of wheat off in twenty minutes. They then feed upon the stem for a long time. My impression is each worm destroys at least two heads

each day, morning and evening. I do not agree with you as to the time of disappearance. They will feed upon the wheat for several days yet. Last year they destroyed wheat until the grain of wheat was well formed, say the middle of June. Hot suns, warm, dry weather is not favorable to them. I sincerely hope we may be relieved from so dangerous a pest, as this portion of Delaware is devoted largely to the growing of wheat, myself and the two adjoining farms here growing 350 acres of wheat.—[H. A. Newland, Middletown, Del., June 3, 1887.

REPLY.— * * * The fresh larvæ indicate that the species is identical with one which we received last year from Indiana. We have an agent in the field at Lafayette, in that State, who is devoting his entire attention to the subject of grain insects, and you can rest assured that this species will not be neglected. It promises, as you say, to become a serious pest.—[June 4, 1887.]

Was it an Accident, or a Wily Milkman?

In the bottle that you will get with this you will find something that we got in the milk this morning; the family were made sick lately, as we suppose, from drinking milk, and I send you this in the interest of science in case it is something new to you, as it is to me, and I would be obliged if you would drop me a line stating what it is.—[W. W. Ryan, 715 Eleventh street, northwest, Washington, D. C., June 30, 1885.

REPLY.— * * * Your note of the 20th instant and the bottle of milk duly received. An examination of the object in the milk showed it to be the pupa of a small beetle surrounded by a little mass of apparently flour and curds. The species proved to be *Trogosita mauritanica* which is found in flour and grain, and the inference is pretty plain that your milkman diluted his milk with some farinaceous material. * * *—[July 1, 1885.]

Cranberry Gall-mites.

I send you by mail this day a package containing a lot of diseased cranberry vines The disease seems to be a fungus growth, and seems likely to destroy the vines. Will you be kind enough to have it examined and also inform me what it is, and any remedy that may occur to you?—[John H. Brakeley, Bordentown, N. J., July 12, 1887.

REPLY.— * * * The small pinkish excrescences are the galls of a gall-mite of the genus *Phytoptus*. These insects will be difficult to destroy as they can not be reached at this season of the year by any application, as they are inclosed within the galls. Do they appear to be wide-spread, or is the damage confined to a comparatively few vines? If it can be determined when the mites first appear in the spring they can then be destroyed by the use of a little sulphur, but we shall be unable to indicate the proper time until the history of this particular species has been studied. So far as we can find out at present it is something new.—[July 15, 1887.]

SECOND LETTER.— * * * As yet I have heard of these diseased vines appearing on only one bog. The disease has spread considerably there. I have advised the proprietor to keep a look-out for a very small fly, which may betray itself by its numbers.

REPLY.— * * * "It will be a waste of time for the proprietor of the cranberry bog which you mention to 'keep on the lookout for a very small fly which may betray itself by its numbers,' as the producer of the gall sent by you, with your previous communication, is not a small fly, but a true Mite. If the disease of the leaves has appeared only upon one bog, of course a very satisfactory way of getting rid of the pest, for some time to come, will consist in picking the leaves from the entire bog and destroying them by fire. Your association and the proprietor of the bog can best determine upon the desirability of going to this expense, but it seems to me it will pay you to assist him in this matter. It is possible also that by carefully watching the leaves and ascertaining when the galls begin to crack and the adult insects to issue, a long flooding of the bog will result in the destruction of a great number of the Mites."—[July 19, 1887.]

Notes on the Chinch Bug in Minnesota.

I have just returned from a rather extensive trip through our southern counties, chiefly to study the Chinch Bugs. There will be but little trouble in 1889, as a very large percentage of these insects has been killed by a fungus (*Entomophthora*). The same disease appeared early in August upon our experimental plots. It started from some holes dug along a low board fence made for the purpose of collecting and killing the bugs; thence it spread to fields with oats and wheat. These fields had a very dense growth of young red clover growing upon them as well, which shaded the ground thoroughly and kept it moist. In a week the disease had spread over the whole farm, and would have killed all the Chinch Bugs if the prevailing moist conditions had continued for some time. But it became very hot and dry, and in the course of a few days the disease came to a sudden halt, excepting in very low or well-shaded fields. As soon as the disease appeared I collected large numbers of the diseased insects, and mailed them to various parts of the State infested by Chinch Bugs. My last trip was made to investigate the effects of this experiment. I found the Chinch Bugs nearly exterminated wherever the disease has artificially been introduced. But the disease has also been at work quite a distance from these centers of introduction, and consequently I am in doubt whether I re-introduced the disease or not. This "but" is quite a bore, and it is now impossible to fathom the truth. If possible I shall keep on experimenting with the various fungi destroying insects, and think of starting, next year, a "cholera farm" in this locality, providing the health commissioners allow it.—[Otto Lugger, University of Minnesota, September 10, 1888.

Epidemic diseases of the Chinch Bug in Illinois.

We are in the thick of work—botanical, entomological, and experimental—on the two chinch-bug diseases which I reported in 1882, both of which are now wide-spread and destructive in southern Illinois. The Entomophthora (12th report, page 53) sprinkles the ground so thickly in some fields with the dead bugs that it makes one think of a flurry of snow; and the bacterial affection seems to be even more destructive, although less conspicuously so. If it comes in the way of any of your people to send me some living bugs from a region where their numbers are not evidently diminishing, I would be glad to have them for experimental use.—[S. A. Forbes, Champaign, Ills.

STEPS TOWARDS A REVISION OF CHAMBERS'S INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[Continued from page 84.]

BUTALIS.

By the addition of the four new species now described, the representatives of this genus known in the United States and Canada are raised to the number 13: these include the unicolorous, mottled, and streaked forms known in Europe, but at present no species allied to the spotted *B. flabella* Led. has been met with. The only two American species with which I am personally unacquainted are the pale "white" or "whitish" *B. planipennella* Chamb. and *B. albipennella* Chamb.

Butalis impositella Z.

=*Gelechia monstratella* Wlk.

=*Butalis matutella* Clem.

This synonymy is verified by reference to Zeller's type, Walker's type, and Clemens' type.

Chambers writes (Bull. U. S. G. G. Surv., IV, 93) that, having bred a large series of *matutella* Clem., he finds its range of variation includes the forms described by himself as *dorsipallidella, brevistriga,* and *immaculatella.*

We shall therefore be probably safe in considering these names as synonyms for one species of which *matutella* Clem. is the type, but this yields priority to *impositella* Z. I am unable to accept Chambers' further suggestion that *trivinctella* Z. should be also included here. The only two specimens I have of this species show a strongly marked difference in the direction, although not in color, of the markings and appear to represent a distinct type, but it should be easy to arrive at a correct conclusion by repeating Chambers's experiments and breeding from the larvæ which feed in a web on the under side of the leaves of various species of *Aster*.

Butalis basilaris Z.

= *flavifrontella* Clem.

This synonymy, suggested by Stainton (Tin. N. Am., 40), is verified by comparison of a true specimen of *flavifrontella* Clem. with Zeller's type of *basilaris*.

Butalis suffusa sp. n.

Antennæ, mouse-gray.

Palpi, mouse-gray, dusted with whitish.

Tongue, clothed at the base with whitish scales.

Head, mouse-gray, streaked with whitish scales on the face and at the sides.

Thorax, mouse-gray, sprinkled with whitish scales.

Fore-wings, mouse-gray, sprinkled and suffused with whitish (in some cases overspreading nearly the whole wing-surface), the scales are narrow and elongate, recalling to mind those of *Butalis pilosella* Z., cilia mouse-gray, with a faint brownish tinge.

Hind-wings and cilia, brownish gray.

Abdomen, mouse-gray, specked with whitish; lateral claspers with a broad, rounded, central projecting end; a rounded, shorter excrescence on the upper side; and a somewhat acute pointed process beneath, which leaves the main stem considerably before its hinder margin; in this respect differing from *Butalis ochristriata.*

Exp. al., 10–12^{mm}.

Habitat, Mount Shasta, Siskiyou County, Cal.

Type, ♂, *Mus. Wlsm.*

I took 6 males in August, 1871.

Butalis perspicillella sp. n.

Palpi, white at the base and all along their upper side; the end of the second joint and the whole of the third joint smeared with brownish fuscous below.

Head, brownish-fuscous in front, margined above and at the sides with white, which extends around the eyes and on the outer side of the basal joint of the antennæ.

Thorax, whitish-ocherous, tinged and smeared with brownish-fuscous, the center above having a purplish iridescent tinge.

Fore-wings, whitish-ocherous, tinged and smeared with brownish-fuscous; having two short brownish, fuscous streaks, the first adjacent to, but below, the fold on the basal third of the wing; the second on the fold scarcely beyond the middle of the wing; above the fold is another short streak, lying nearer to the first than to the second of these already mentioned; towards the apex is a slight fuscous shade preceded by a small spot of the same color; cilia brownish-fuscous.

Hind-wings, iridescent purplish-fuscous, coarsely scaled; cilia brownish-fuscous.

Abdomen, iridescent purplish-fuscous above; the lateral appendages on the ultimate segment whitish ocherous.

Exp. al., 10^{mm}.

Habitat, California.

Type, Riley Coll. [U. S. N. M.], No. 166, labeled "Folsom 15, 4, 85, California."

Butalis aterrimella Wlk.

Gelechia aterrimella Wlk.

The following is a description taken from fresh specimens, undoubtedly identical with this species:

Antennæ, simple brownish-black.

Palpi, brownish-black.

Tongue, clothed at the base with brownish-fuscous scales.

Head, face, and thorax, brownish-black.

Fore-wings, brownish-black, with a patch of scattered white scales on the middle of the fold, and a few whitish scales beyond them, sparsely scattered towards the apical portion of the wing; these white scales appear to be very fugitive, and in a worn specimen are almost entirely removed; cilia, grayish-fuscous.

Hind-wings, brownish-fuscous.

Underside of fore and hind wings, brownish-fuscous.

Abdomen, brownish-fuscous, with a few ocherous scales about the ultimate segment in the male.

Legs, brown-black.

Exp. al., ♂ 14^{mm}, ♀ 13^{mm}

Habitat, St. Martin's Falls, Albany River, Hudson Bay; Orono, Me.; Mount Shasta, Siskiyou County, Cal.

Type, ♂, *B. M.*

Both sexes received from Professor Fernald, taken at Orono; I have also a single, male, which I took on Mount Shasta in August, 1871.

Butalis ochristriata sp. n.

Antennæ, brownish-gray.

Palpi, whitish, widely barred across the outside of the second joint, at its upper end, with brown-gray, and sprinkled with the same color along the under side of the apical joint.

Tongue, clothed with whitish scales at the base.

Head, mouse-gray, fading to whitish laterally around the eyes.

Thorax, mouse-gray, paler at the sides and on the patagia.

Fore-wings, mouse-gray, sprinkled with long whitish scales on the outer half of the extreme margin, and all over the apical portion of the wing to the base of the dorsal cilia; a broad whitish-ocherous streak starts from the middle of the base and follows the line of the fold, to beyond the commencement of the dorsal cilia, fading into the ground-color on the middle of the wing above them; cilia brownish-gray.

Hind-wings, brownish; cilia brownish-gray.

Abdomen, mouse-gray; ♂ with the lateral claspers bulged above at their outer extremities, and prolonged at their lower angle into slender points, tending obliquely downwards, and about equal in length to the posterior margin of the claspers themselves; in this respect as in its coloring this species differs from its numerous allies.

Legs, whitish-gray.

Exp. al., 11^{mm}.

Habitat, Sheep Rock, Siskiyou County, Cal.

Type ♂, *Mus. Wlsm.*

Described from two males taken in August, 1871.

Var. A.—In some specimens the mouse-gray ground color of the fore-wing is replaced by brownish-fuscous or purplish-fuscous; the light scaling on the costa and apical portion of the wing being obsolete, and the hind-wings assume an almost purplish tinge.

Habitat, Mendocino County, Cal. A single female taken on May 24, 1871; Siskiyou County, Cal., seven males, August, 1871.

Types, ♂ ♀, *Mus. Wlsm.*

Var. B.—Another variety has brownish-gray fore-wings, the whitish-ocherous stripe being entirely, or almost entirely, obliterated, a number of scattered dull whitish-ocherous scales giving a mottled appearance to the almost unicolorous fore-wings. Some specimens of this variety are very small, their expanse reaching only 9^{mm}.

Habitat, Shasta County and Siskiyou County, Cal.

Types, ♂ ♀, *Mus. Wlsm.*

Described from nine males and five females taken in July and August, 1871.

I should certainly have regarded these three forms as specifically distinct had it not been for a careful examination of the genital appendages, which appear to be precisely similar. Moreover, my specimens of all the forms were taken at approximately the same time and place.

Butalis albilineata sp. n.

Antennæ, brownish-fuscous.

Palpi, white, dusted with brownish-fuscous, especially on the outer side.

Head, brownish-fuscous, with some whitish scales on the face and about the eyes.

Thorax, brownish-fuscous, touched with white on the patagia.

Fore-wings, brownish-fuscous, with a strong white line of even width running from the middle of the base to the apical margin below the apex; the extreme costa very narrowly whitish beyond the middle; cilia brownish-fuscous with a few white scales along the costa and beneath the apex.

Hind-wings and cilia, ♂ dark purplish-fuscous; ♀ brownish-fuscous.

Abdomen, brownish-fuscous above, white beneath.

Legs, brownish-fuscous, with a good deal of white about the tarsi and on the underside.

Exp. al., 10^{mm}.

Habitat, Arizona.

Types, ♂ ♀, *Mus. Wlsm.*

One male and two females received from the late H. K. Morrison.

This species approaches very closely the European *B. schleichiella Z.*

Arotrura, gen. n.

["αροτρον = plow, οὐρα' = tail.]

Type *Arotrura eburnea* Wlsm. ♂ ♀.

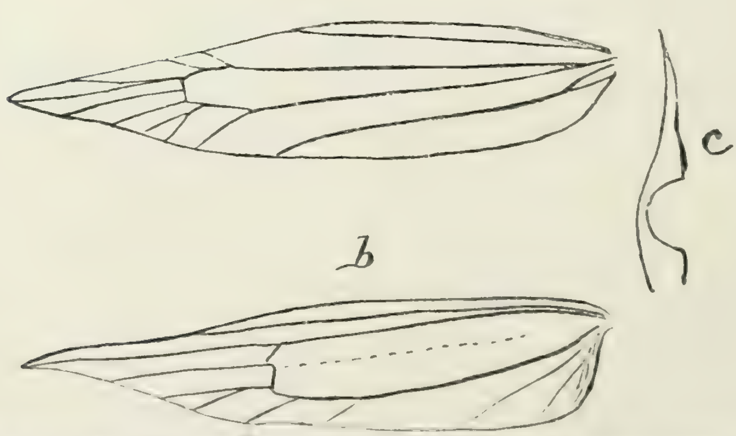

FIG. 22.—AROTRURA EBURNEA Wlsm. Neuration and uncus. *a*, Anterior wing; *b*, posterior wing—enlarged (original).

Antennæ, simple throughout; basal joint flattened, elongate.

Labial palpi, porrect, slightly recurved; basal joint clothed with closely appressed. scales; apical joint two-thirds as long as the second, tapering, but somewhat stout.

Maxillary palpi, very short and inconspicuous.
Tongue, very long, clothed with scales only at the extreme base.
Ocelli, absent.
Head, smooth.
Fore-wings, elongate, sharply lanceolate, the costa slightly bulged before the middle; 11 veins; 3 and 4 from a common stem; 7 and 8 from a common stem, the lower branch running to the apex, the upper to the costa.
Hind-wings, elongate-lanceolate, sharply pointed, the costa arched before the middle, the abdominal margin somewhat widened and depressed.
Abdomen, genital segments of ♂ largely developed; the uncus and lateral claspers tapering posteriorly; the points, slightly upturned, extending three-sevenths of the whole length of the abdomen; the ovipositor of the ♀ extruded.

Arotrura eburnea, sp. n.

Antennæ, ivory-white; basal joint elongate, flattened at the base, and slightly arched.
Palpi, ivory-white; clothed with appressed scales, which are somewhat dilated downwards on the basal joint only; apical joint about two-thirds the length of the second, somewhat less stout, but by no means slender.
Tongue, very long, clothed at the base with ivory-white scales; beyond, naked, light yellowish-brown.
Head, face, and thorax, smooth ivory-white.
Fore-wings, elongate, sharply lanceolate, ivory-white; cilia, ivory-white.
Hind-wings, pale grayish-fawn; cilia pale fawn at their base, fading outwardly into fawn-white.
Under side of fore and hind wings, tinged with grayish-fuscous in the ♂, tending to pale fawn color in the ♀.
Abdomen, ivory-white; somewhat ochreous beneath; ♂, uncus single, very long wide at the base, but somewhat laterally compressed above, having a narrow stalk immediately beyond the base, whence it is laterally compressed, downwardly dilated, and tapering posteriorly to a narrow and slightly upturned gouge-shaped point; lateral claspers rounded externally, with an angulated projection at about the middle of the upper edge, whence they taper posteriorly to a narrow, slightly upturned obtuse point, reaching as far as the end of the uncus; within these claspers, and projecting slightly beyond the angle at the middle of the upper edge, are two spatulate appendages, or supplementary claspers, fringed, with hairs along their edges and about their surface. ♀ with the ovipositor strongly exserted, flattened at the base, and fringed at the extremity with similar hairs to those found on the supplementary claspers of the male.

Exp. al., 20^{mm}.

Habitat, Arizona.

Types, ♂ ♀, *Mus. Wlsm.*

Two males and one female received from the late H. K. Morrison.

Without a careful examination of the neuration and genital segments this species would undoubtedly have been regarded as a *Butalis*, for although somewhat larger than the ordinary forms of this genus; it has almost exactly the shape of wings and general appearance which distinguish it. The fore and hind wings are, however, somewhat narrower towards the apex.

(*To be continued.*)

GENERAL NOTES.

SYNONYMY OF THE MEALY BUG OF THE ORANGE.

In 1880 Prof. J. H. Comstock described the common Mealy Bug found on Orange trees in Florida as *Dactylopius destructor*,* and by this name it has since been generally known in this country. The same species is stated by Professor Comstock to be common in northern greenhouses upon a variety of plants.

In the Florida Dispatch for June 25, 1888, Mr. W. H. Ashmead announces that *D. destructor* Comstock is synonymous with *Lecanium phyllococcus*, described by him in the *Canadian Entomologist* for August 1879 (Vol. XI, No. 8, p. 160), and that the species should therefore be known as *Dactylopius phyllococcus* (Ashm.).

There is little doubt, however, that this species is identical with the *Coccus citri* of Boisduval (see Boisduval, Entomologie Horticole, 1867, p. 348, fig. 48), as described at length by Signoret in the Ann. Soc. Ent. France, 1875, page 312, and as figured upon Plate XIV, figures 2, 2^a, and 2^b of the same volume, under the name *Dactylopius citri* (Boisd.). This conclusion is arrived at by Penzig in his Studi Botanici sulle Agrumi e sulle Piante affini, Rome, 1887, p. 530, after a careful comparison of Comstock's descriptions and figures with the European insect; and there is at present no reason why this conclusion should not be adopted in this country.

D. citri is said by Penzig to be one of the worst of the Orange enemies in Italy, both from the damage caused by its punctures and from the abundance of the smut fungi—*Meliola* and *Cladosporium*—by which its attacks are followed.

ENTOMOLOGY IN CHILI.

Prof. Frederico Philippi lately favored us with copy of his "Catalogo de los Coleopteros de Chile" (reprinted from the Anales de la Universidad de Chile, Vol. LXXI, 1887). Since the publication of Vols. IV and V (1849–'51) of the "Historia fisica i politica de Chile" by Claudio Gay, this is the first attempt at collating the Coleopterous fauna of that country. In Gay's "Historia" the Coleoptera known from Chili amounted to 345 genera with 891 species, whereas Prof. Philippi is now able to enumerate 686 genera with 2,247 species. This is undoubtedly a large increase, but the whole number evidently represents only the smaller portion of the Coleoptera actually occurring in Chili, which is so diversified in regard to climatic and geological conditions. From the nature of the conditions it is apparent that the Chilian fauna admits of but little opportunity for comparison with the fauna of North America. Still, in perusing Philippi's catalogue we find that it contains 30 species

* Rept. Ent., Ann. Rept. Dept. Agr., 1880, p. 342.

which occur also in North America. By far the greater portion of these are, however, species of general distribution occurring in almost every part of the globe. Eliminating these, the following true American species are common to the faunas of the United States and Chili: *Tetracha carolina*, *Bidessus affinis*, *Laccophilus americanus*, *L. proximus*, *Gyrinus parcus*, *Tropisternus glaber*, *T. lateralis*, *Lathrobium dimidiatum*, *Atænius gracilis*, *Bruchus scutellaris*, *Megilla maculata*, *Eriopis connexa*.

Besides this work on Coleoptera, we have a Catalogue of the Chilian Lepidoptera, by Mr. William Bartlett Calvert, published at Santiago de Chile in 1886, and which enumerates 89 species of Diurnals and 366 of Heterocera; and a list of the Chilian Diptera by Dr. R. A. Philippi in the Verh. K. K. Zool. Bot. Ges. in Wien, 1865, which of course is now somewhat antiquated.

THE LARVA OF THE CLOVER STEM BORER, *Languria Mozardi* Latr., AS A GALL MAKER.

On September 5, 1888, while searching for galls on Solidago, which grows abundantly on the bluffs in the vicinity of La Fayette, Ind., we found a well-developed gall on a stock of wild lettuce (*Lactuca canadensis*, L.). This gall was opened carefully, and found to contain a pupa, plainly Coleopterous, of a yellowish color, much enlarged anteriorly but more slender posteriorly. The gall was at once bound up, the pupa having been replaced in its cavity exactly as found, and the whole placed in a glass jar. On September 21, sixteen days after, an adult of *L. mozardi* made its appearance in the jar, and an examination of the gall revealed the cavity empty, and the avenue therefrom through which the beetle had made its escape.

Prof. J. H. Comstock states in the report of the Commissioner of Agriculture for the year 1879, p. 199, that the insect, as a clover pest, pupates in the lower part of the stem in which the larva originated. We have ourself found larvæ not distinguishable from those of this species burrowing in the stems of timothy, where they pass the winter in the larval stage (see Report Commissioner of Agriculture, 1886, p. 574). The question involved seems to be, is the species evolving to or from a gall maker?—[F. M. Webster.

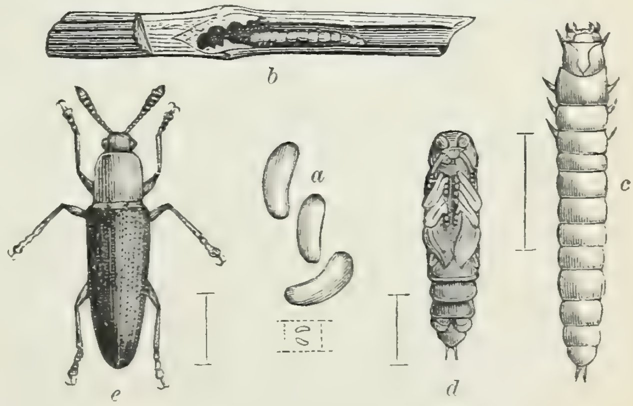

FIG. 23.—LANGURIA MOZARDI. *a*, egg; *b*, larva in clover stem; *c*, larva; *d*, pupa; *e*, adult (after Comstock).

THE USE OF OSAGE-ORANGE AS A FOOD FOR SILK-WORMS.

Some three years ago the chamber of commerce of Lyons, France, established a silk laboratory, under the direction of Monsieur J. Dusu-

zeau. Among the many objects of this work was that of collecting specimens of the cocoons of wild silk worms from all portions of the world, with a view to determining whether their silk might not be used commercially to a greater extent. It was also desired to find some wild species which might be successfully crossed with the *Bombyx mori* and lend new vigor to a species which has been weakened by centuries of domestication.

At the same time some interest has been excited by the success attained in this country through the use of osage-orange (*Maclura aurantiaca*) in feeding silk-worms, and at the request of M. Dusuzeau, the Division has furnished him with specimens of osage-raised cocoons. Of them he writes:

These three varieties of cocoons are very regular, firm, and fine. I have recently reeled 100 grams of each, and I will send you, a little later, complete reports of the three trials. I must say to you that the variety fed upon mulberry reeled excellently, without the threads breaking; those of the two varieties fed on maclura were a little less satisfactory, breaking several times. But it will not be possible to draw an exact conclusion from this trial, because the first lot is of unknown origin and can not be compared with the second and third lots, themselves raised from eggs furnished by different houses.

The request for the samples mentioned came too late for me to make a selection proper for such an experiment. This year a better selection will be made and it is hoped that results of more value may be obtained.

In this connection M. Natalis Rondot, the celebrated French statistician, writes:

I am anxious to settle this question of the raising of worms on the leaves of the osage orange, as I am now doing in China, with the leaves of the *Cudrania triloba*.*

Before determining what advantage the silk raiser would derive in using the leaf of the maclura, it will be necessary to know what is the quality of the silk drawn from the cocoons of the worms nourished with this leaf. It will be necessary to examine the filament of these cocoons.

In this work the Division will give the French scientists all the assistance in its power, and it may be that we shall be able to record important results at a later date.—[Philip Walker.

THE PEAR DIPLOSIS IN ENGLAND.

In our Annual Report for the year 1885 we gave a full account of this insect, and from the mode of its occurrence we had good reason to believe that it was an importation from Europe and probably identical with the *Cecidomyia nigra* (Meigen) of Schmidberger and *C. pyricola* of Nördlinger. At that time no European specimens of the imago existed in any collection, so that a direct comparison of the European and American species was out of the question. In 1885 Miss E. A. Ormerod (report of observations of injurious insects for 1884) first called attention to the existence of the Pear Midge in England, the pest being espe-

* The *Cudrania triloba* is a bush of the Nettle family (Order *Urticaceæ*). It is not found in the United States.

cially bad in Marie Louise pears. However, no imagos were obtained until, in 1887 and 1888, Messrs. R. H. Meade and Peter Inchbald succeeded in breeding the imagos. Mr. Meade carefully compared them with our description, and finds the English insect absolutely identical with the American form. He has recently published a very careful and independent description of the imago, giving at the same time a full account of the life-history of the insect as hitherto observed in England.* In view of the uncertainty regarding the names given to the insect by the older authors, viz: *Cecidomyia nigra* of Meigen and Schmidberger, and *C. pyricola* of Nördlinger, Mr. Meade proposes to drop these names and to accept *Diplosis pyrivora* Riley, which we had provisionally given and by which it can be identified with certainty.

THE ORCHID ISOSOMA AND A REMEDY FOR ITS INJURY.

Some years ago Professor Westwood described a phytophagous species of the Chalcid genus Isosoma (*I. orchidearum*) which is injurious to Orchid plants belonging to the genus *Catleya.* These are ornamental and highly-prized plants, the pride of owners of greenhouses, and the injury by the Isosoma larvæ infesting the stems and the leaves is very annoying. M. Künckel d'Herculais announces (Ann. Soc. Ent. de France, 1888, Bull., p. 23) that he, in connection with M. Gazagnaire, is studying this Isosoma which has appeared in some greenhouses in Paris, and that he is preparing a paper on the subject. M. Gazagnaire proposes to kill the Isosoma larvæ in their burrows by means of a triangular dissecting pin. The larvæ do not need to be extracted, and the wound inflicted on the plants by this botanico-surgical operation is insignificant.

The insect has been quite common in some of the Paris conservatories lately, and in view of the skepticism which yet prevails among some of the English entomologists as to its phytophagic nature, we may add that from specimens submitted to us by Dr. L. Felix Henneguy while we were in Paris last October, we had an excellent opportunity of rearing both sexes and of watching the larvæ in all stages. We repeatedly saw the larva feeding on the orchid substance, and the cavity made is at first only just large enough to contain it and its vegetal frass.—C. V. R.

FALSE REPORT OF PHYLLOXERA IN AUSTRALIA.

Australia has just recovered from a Phylloxera scare. The *Adelaide Garden and Field* for July, 1888, states that rumors had been current for a few days that the phylloxera had been discovered at a Mr. Hardy's vineyard at McLaren Vale. The report arose from the fact that some vine cuttings recently planted showed a peculiar enlargement of some

* Diplosis pyrivora Riley, the Pear-gnat, by R. H. Meade. The Entomologist, Vol. XXI, No. 300, May, 1888, pp. 123–131.

of the rootlets. This proved on investigation to be a fungus disease of the vine.

APROPOS TO HOT WATER AS AN INSECTICIDE.

Our esteemed New Zealand correspondent, Mr. R. Allan Wight, writing as to the use of hot water as an insecticide, tells a rather remarkable story as follows:

An old lady of his acquaintance had a fine old grape-vine in her garden which went over the wall and bore fruit in her neighbor's yard, and she was spiteful enough to take the kettle off the fire and pour the entire contents on the vine (she dared not cut it down, for both houses were rented from the same landlord). She failed of her purpose, for the vine was not injured in the least.

VALUE OF DEAD LOCUSTS AS MANURE.

In a letter to us some time ago Mr. J. Birkbeck Nevins, of Liverpool, gave an analysis of dried locusts from observations made by Edward Davis, F. C. S., President Liverpool Literary and Philosophical Society, as follows:

	Without wings.	Wings developed.
	Per cent.	*Per cent.*
Phosphoric acid (P_2O_5)	1.92	1.89
Tribasic phosphate of lime	4.21	4.13
Nitrogen	10.14	10.64
Ammonia	12.31	12.92

This shows that these dried locusts are as rich in nitrogen as meat, guano, or dry blood, and contain enough phosphoric acid to greatly increase its value as a manure, which English authorities estimate at about $25 per ton.

THE INSIDIOUS FLOWER-BUG.

According to *Garden and Forest* for August 22, *Triphleps insidiosus* has been doing considerable injury among some of the Chrysanthemum collections near Boston this summer by piercing the ends of the shoots, causing them to "go blind" and the leaves to curl up and wither. The statement is made that pieces of cloth kept saturated with kerosene oil bound around the ends of slender sticks and stuck in the ground among the plants so that the saturated cloth is about on a level with the ends of the shoots, seems to have the effect of driving away the insects.

SPECIAL NOTES.

Prof. A. J. Cook's latest bulletin * is devoted to a consideration of experiments with insecticides and implements for their application. The larger portion of the bulletin refers to the treatment of apple trees for Codling Moth and plum and cherry trees for Plum Curculio. Professor Cook designed to show the relative effect on foliage from repeated sprayings with London purple and also the comparative immunity from injury of trees so treated. The data on which he constructs his table are so indistinct that it is difficult to form conclusions concerning them. We gather, however, that where trees were treated once the foliage was uninjured and few apples were perfected or ripened; where treated twice, foliage slightly injured and "much fruit" perfected; where treated three times, foliage more injured (sometimes seriously) and "much fruit" perfected. The applications were made on the 6th, 12th, and 20th of June. The preparation used was 1 pound London purple to 100 gallons of water. The check trees were crab-apples, one of which bore few apples and the other bore heavily. He concluded that "it is more and more patent that it pays remarkably well to spray our apple trees."

In view of the extensive practical experience of orchardists for many years now with the arsenites as a protection from the Apple-worm, additional experimentation is hardly necessary on this point, as the value of this preventive method has become fully established, the only question to be advantageously discussed in connection therewith being the risk of poisoning, which, as experience and Professor Cook's experiments in the past have shown, is reduced to a minimum, or may be left out of account altogether where proper precautions are taken. It is otherwise with these arsenites as a preventive for Curculio attack. We have long felt that they might be used with benefit for this purpose, and have recommended their trial, but from the nature of the case we have anticipated less good than in the case of the Apple-worm, and Professor Forbes' experiments and some unpublished experiments which we have had made by Mr. Alwood confirm this view. Several plum and

* Agricultural College of Michigan, Department of Zoology and Entomology. Bulletin 39. September, 1888.

cherry trees were treated by Professor Cook with London purple on the same dates, with the result that good crops of perfect fruit were gathered, "while cherry and apple trees near by suffered seriously." Professor Cook concludes that with plums, cherries, and apples, two or three applications for the Curculio are of advantage.

He also discusses methods of applying liquids, mentioning favorably the geared Victor Field force-pump, the Perfection hand-pump, Gould's double-acting barrel-pump, the Whitman pump, and the Lewis pumps. Some of these we could not indorse so favorably for such work, but will withhold any remarks we might make for a forthcoming bulletin on this subject. The subject of nozzles is mentioned, and in six words he disposes of the Riley or Cyclone nozzle as a comparative failure, an experience which neither accords with our own nor with that of many other horticulturists and entomologists both at home and abroad, and makes one question whether Professor Cook uses it properly or in improved forms. The Nixon nozzle and the Lowell graduating nozzle are commended. All the illustrations are from trade circulars.

A number of remedies, aside from arsenical sprays, are noticed. Among these, carbolized lime and plaster for Curculio, applied dry, are said to have been successful. Bisulphide of carbon was used very successfully to destroy ants by making an opening down into the colony, pouring in about half a gill of the liquid, and stopping up the opening by packing in clay. We have had best success with it by igniting it after covering the ground for about ten minutes with a damp blanket.

Mr. C. P. Gillette, the entomologist of the Iowa station, has two articles in Bulletin No. 2 of the station,* received October 8, the one entitled "A few important Chinch Bug remedies," and the other "Arsenic experiments."

Under his first head, Mr. Gillette considers plowing, burning, shading the ground, and neat farming. Mr. Gillette has made some experiments in plowing, and finds that when the bugs are buried to a depth of 7 inches they never come to the surface again. At 5 inches nearly all are permanently interred, while at 3 inches they all emerge within twenty-four hours. He advises, therefore, that the furrow should be turned at least 6 inches deep, and that a jointer should be used on the plow.

The subject of using soluble arsenic as an insecticide has again been brought to public attention by several writers, and this probably suggested Mr. Gillette's experiments. But we believe that its use does not rest on a clear conception of what constitutes a practical insecticide. The end sought in the use of arsenic is to destroy the insect with a minimum amount used in the safest possible manner to plant and ani-

* Iowa Agricultural College, Experiment Station. Bulletin 2, August, 1888.

mal life. So far as plant life is concerned, it is much preferable to use it in insoluble form, and used in this form we can not see that it is any more apt to cause injury to stock.

A series of experiments directed towards the preparation of an arsenite of less specific gravity than Paris green, and not more insoluble than London purple, would in our estimation yield good results. Soluble arsenic, because of its rapid absorption by the leaves of plants and consequent caustic effects, is useful only in comparison with other preparations.

Mr. Gillette's conclusions from his experiments with arsenic are practically those reached by us as long ago as 1879, and as formulated in Bulletin 3 of the Entomological Commission. He finds by experiment that arsenic in the proportion of 1 pound to 400 gallons of water scorches the tips and edges of the leaves of Apple. One pound to 800 gallons damaged the leaves of Plum too badly to allow this strength to be recommended. One pound to 250 gallons scorched the leaves of Grape badly. One pound to 400 burnt the leaves of Box Elder badly. One pound to 500 burnt the leaves of Honey Locust badly. One pound to 800 scorched the leaves of Poplar badly. One pound to 500 destroyed one-half of the surface of the leaves of Raspberry, etc. American Elms resisted the best of any plant experimented upon, while Plum was most susceptible. With the latter tree he found that in the proportion of 1 pound to 1,200 gallons of water about half of the leaves were taken off and the remainder were left looking sickly and somewhat burnt. He concludes that arsenic can not be used in solution stronger than 1 pound to 1,200 gallons of water, and experiments show that apple leaves sprayed with this solution could be fed to the larvæ of *Datana ministra* without apparently affecting them. Tests made by the chemist of the station, Prof. G. E. Patrick, show that the leaves unquestionably absorb a certain proportion of the arsenic. Mr. Gillette expresses himself more strongly against the use of this poison than any one who has yet written about it. He says, "It would be unwise in the extreme to recommend the latter (arsenic), especially if it be in solution, for insecticidal purposes."

Both the articles are timely, and we look forward with interest to the results of Mr. Gillette's work. Both, however, are marred by very abundant orthographical errors, probably the result of hasty proof-reading.

Washington and other eastern cities have been exceptionally free from the attacks of shade-tree pests the past summer, particularly from the defoliators, such as the Elm Leaf-beetle and the Fall Web-worm. The Web-worm has been exceptionally scarce in Washington, and only late in September were a few webs of the second generation observed. The Elm Leaf beetle, while rather more abundant, has been much less so than

usual, and this reminds us of an occurrence which shows how careful one must be in drawing conclusions from experiments to destroy insects. Counting upon the ordinary appearance of the Elm Leaf-beetle, we sprayed the trees in our garden with London purple early in the summer, and as no damage was done, we were quite of the opinion that the spraying had been a success until, later, we noticed that unsprayed trees were quite free also. In the same way a gentleman came to us toward the end of the season and informed us that he had completely protected his trees, by spraying the grass under them with Paris green, his trees for the first time in several years having retained the verdure of their foliage.

SOME RECENT ENTOMOLOGICAL MATTERS OF INTERNATIONAL CONCERN.*

Entomology is one of the most fascinating branches of natural history, but its devotees find such a vast number of species to deal with (very many yet unstudied) that their work is for the most part somewhat exclusive and interests few but the specialist. In truth, though so important in the economy of nature and in their relations to man, insects are yet too often looked upon as rather unworthy his serious thought.

Nevertheless there are many insects which possess general interest by virtue of the manner in which they affect man directly or indirectly. Among such may be mentioned species which prevail in several different parts of the world, and the interest is enhanced if they affect man's comfort and convenience, or are injurious to agriculture or horticulture. It is my intention this evening to refer to three of the latter class, which have lately become rather notorious.

In doing so I omit extended consideration of the methods that recent investigation have shown to be most efficient in enabling the cultivator to contend with and control these enemies to agriculture; for, though this practical bearing of the subject is of immense importance to the people concerned, I take it that none of those in my hearing are practically interested.

THE ICERYA OR FLUTED SCALE.

The first is what I call the Icerya or Fluted Scale (*Icerya purchasi* Maskell). It is one of our largest scale-insects (family *Coccidæ*), and has of late years done immense injury to the orange groves and to many other trees and shrubs of southern California. The history of the species is interesting, and points to Australia as its original home and to its introduction from Australia to New Zealand, Cape Town, South Africa, and California. Nothing was known or published upon

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*Read by C. V. Riley before the Philosophical Society of Washington, D. C., March 31, 1888, and illustrated by diagrams.

the species prior to the seventh decade of this century, and it seems to have first attracted attention almost simultaneously in Australia, Africa, and America, all the evidence pointing to its introduction into California by the late George Gordon, of Menlo Park, about the year 1868, and probably from Australia on *Acacia latifolia*.

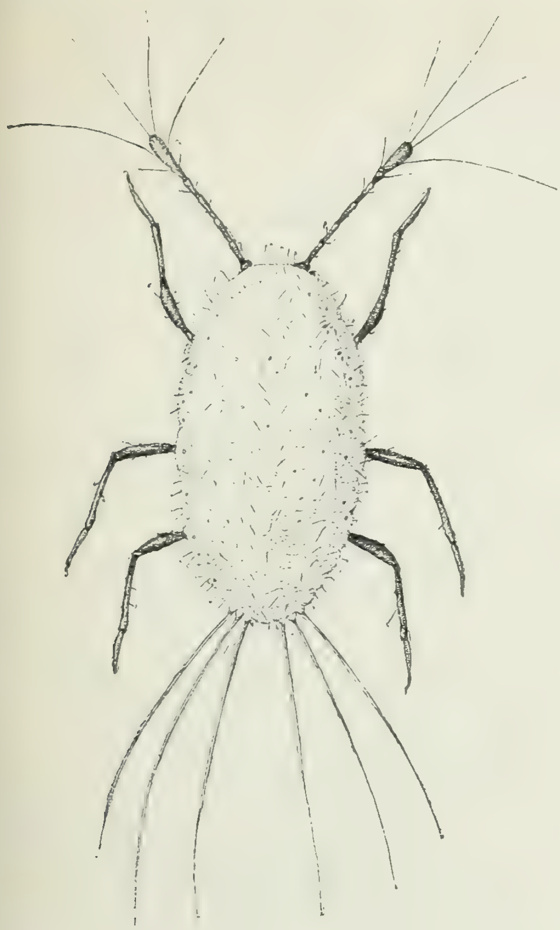

Fig. 24. *Icerya purchasi*, newly hatched female larva—greatly enlarged (after Riley).

The genus *Icerya* was founded by Signoret, a French entomologist, in 1875, being based upon the single species *I. sacchari* (Guérin). This species and the one that we are now dealing with are the only two species of the genus.

In my Annual Report as United States Entomologist for 1886 I have given a very full characterization of the species in all its stages, but the only facts that I need draw attention to on this occasion are, first, "That the female undergoes three molts and the male two; *i. e.*, each has one more stage than had previously been recognized by entomologists and observers; secondly, that it differs from all other members of its family (*Coccidæ*) in its extended powers of locomotion in most of its stages; in its extreme hardiness or power of surviving for a given period without food, and in its

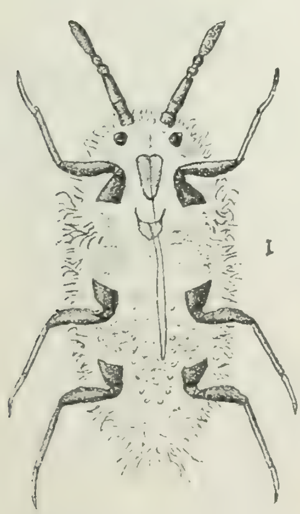

Fig. 25. *Icerya purchasi*, male larva, second stage—greatly enlarged (after Riley).

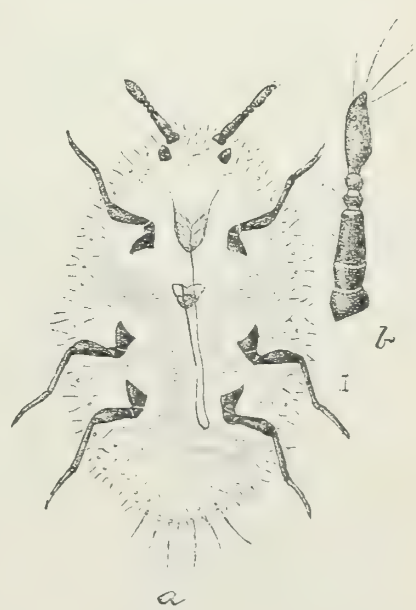

Fig. 26. *Icerya purchasi*, *a*, female larva, second stage—enlarged; *b*, antenna—still more enlarged (after Riley).

polyphagous habit, or the ease with which it accommodates itself to so great a variety of plants. These are the three characteristics which most concern the practical man and which make it one of the most difficult species to contend with.

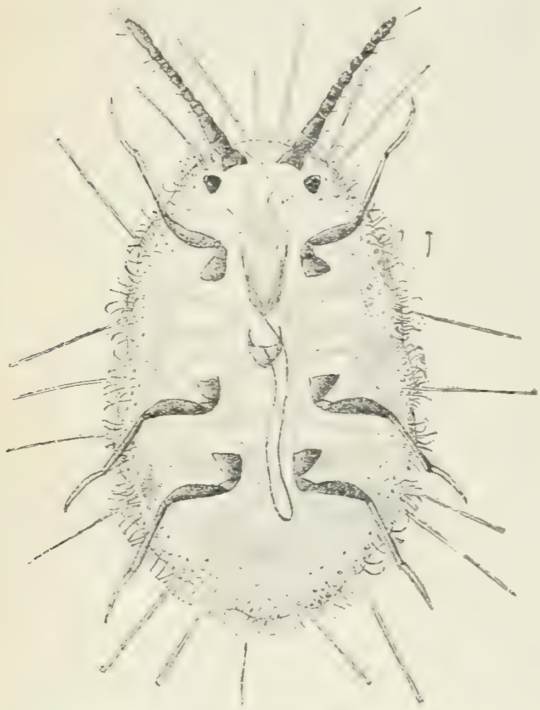

FIG. 27. *Icerya purchasi*, female larva, third stage—enlarged (after Riley).

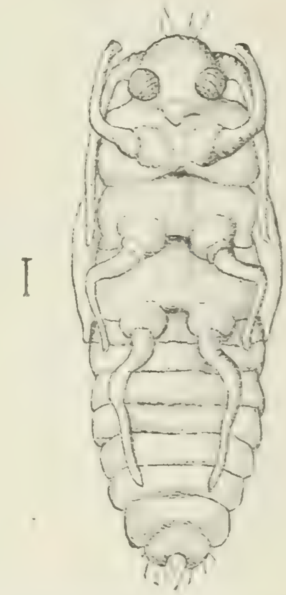

FIG. 28. *Icerya purchasi*, male pupa, ventral view—enlarged (after Riley).

"A very long list of plants might be enumerated upon which this insect is either found accidentally or upon which it can live more or less successfully. But the list of plants, especially of trees, important to us for their products, which are seriously affected by it is compara-

FIG. 29. *Icerya purchasi*, adult male, enlarged: *a*, joint of antenna; *b*, tip of tarsus; *c*, wing pocket and hooks, still more enlarged (after Riley).

tively limited, and will include the Acacia, Lime, Lemon, Orange, Quince, Pomegranate, and Walnut. Some few other trees might be added, and it is particularly partial to the Rose and the Nettle; but it is doubtful whether the species could permanently thrive and multiply to an injurious extent on many other trees than those mentioned.

"All young scale insects are quite active when they first hatch, and most of them at this time are extremely small, and when very thick upon a tree, instinctively, or at least very easily, drop from the terminal twigs and branches. Their specific gravity at this time is so slight that they are easily wafted with the wind in their descent. This general truth applies with equal force to the Icerya, which is readily carried from tree to tree and from orchard to orchard by the agency of wind, by running water, or by birds or other insects. Another local means of transport not to be ignored is upon the clothing of persons engaged in cultivating, upon packages, and upon all implements used, whether in cultivating or harvesting the crop. This particular species also has quite a habit of crawling over the ground, and its local spread is very materially enhanced thereby.

"It is carried long distances, however, chiefly by high winds, birds, and commerce, and its introduction from one continent to another has undoubtedly been effected by the latter method upon young trees or cuttings."*

More light, however, is yet needed upon the question of the original habitat of the species, and as the settlement of the question is important in many respects I have during the past year been endeavoring to get definite information upon the subject. Without going into technical details, which would not interest you, I may briefly state that the question arose in my mind a year ago as to the probable identity of *Icerya purchasi* and *I. sacchari*, which last came from the islands of Mauritius and Bourbon, and which is injurious to Sugar-cane there. On the supposition that the two described forms were specifically identical, light is at once thrown upon its wide distribution. It occurred to me that an insect which affected the sugar-cane could be easily transported from the sugar-producing islands in the Indian Ocean to Australia, South Africa, and California, either consecutively one from the other, or to either or all directly, through the sugar trade, especially when it is known that in many cases in packing the coarser sugars it is the custom to put pieces of cane in the packages to facilitate drainage. I took some pains, therefore, to first decide by an examination of specimens whether *purchasi* was really distinct from *sacchari* or not, and this could only be done conclusively by examination of the types. My old friend, Dr. Signoret, who is the leading French authority on the Coccidæ, was unfortunately very ill at his country home when I was in Paris, last October, but he kindly sent his keys and permitted me to examine his collection

* From an address by the writer before the State Board of Horticulture at Riverside, Cal., April 7, 1887.

and to satisfy myself that *sacchari* was really distinct from *purchasi*. This fact, while not absolutely opposed to the idea of the origin of the Fluted Scale from the islands of Bourbon and Mauritius, because both species may occur there, tends, nevertheless, to confirm the prevailing opinion, and that which I originally held, viz, that the native home of the species is in Australia.

A limited number of natural enemies and parasites have already been discovered upon it in California. They are as follows:

Among predaceous insects:
- *Chrysopa* sp.
- *Hippodamia ambigua* Lec.
- *Blastobasis iceryæella* Riley.
- *Blapstinus brevicollis* Lec.
- ? *Perimegatoma cylindricum* Kirby, var. *angulare*.
- *Largus succinctus*.
- *Piesma cinerea* Say.
- *Corizus hyalinus* Fabr.
- *Peritrechus luniger* Say.
- *Beosus* sp. (probably new).
- *Lyctocoris* sp. (probably new).
- *Piezostethus* sp. (probably new).

Among true parasites:
- *Isodromus iceryæ* Howard.
- *Coccophagus* n. sp.
- *Entedon* n. sp.
- *Alaptus iceryæ* n. sp.
- *Thoron* n. sp.
- ? *Goniozus* n. sp.

In Mexico:
- *Phora* sp.
- *Scymnus amabilis* Lec.

In South Africa:
- *Rodolia iceryæ* Baly.

Now, as the number of these enemies (and particularly of the parasites) increases, the fruit-growers of California will get more and more relief from the ravages of the Icerya; but it is an interesting fact that in Australia, which, as we have seen, is in all probability its native country, the species is not so injurious as it is with us, the reason being, doubtless, that it has natural enemies there which serve to keep it in check, and which have not been transported with it to the countries of its introduction. Here we have a case where it would be eminently fit to have these enemies in Australia especially studied and to attempt to introduce them to California; for the successful accomplishment of this would, without doubt, result in immense benefit to the people of that State. With most of the parasites this would be an easy matter from the very manner in which they are known to affect the Icerya. In fact, since I delivered an address upon this subject, last spring, at Riverside, Cal., the people of that State have been alive to the importance of the subject, and have in county and State conventions appealed by resolution to Congress to authorize the sending of a commission to Australia for this purpose.

This is nature's method of checking the evil, and one which it were wise for man to adopt. At the present time it is possible for the fruit-growers of California to protect their fruit trees by vigilant means and rather large expenditure of time and money, and where these are not employed ruin stares the orange-grower in the face. The introduction of the natural enemies which keep the species in check in its native country would soon bring about a change in this country, and its intro-

duction would relieve the orange-grower of the necessity of so much expenditure to bring about the same result. Just as we employ cats to kill off mice and ferrets to kill rats, so in economic entomology it behooves us to encourage the entomological enemies of our insect foes, especially in cases like the present, where there is a feasible method promising good results in the introduction.

THE HESSIAN FLY.

(*Cecidomyia destructor* Say.)

This is a fragile midge belonging to the Diptera and to the family Cecidomyidæ, and you will get a very fair idea of its general color and appearance by recalling the common mosquito. It is one of the insects most destructive to Wheat, Rye, and Barley. At the present season it is found in what is known as the flax-seed or puparium state. This is the hardened larval skin inclosing the quiescent larva and ultimately the pupa. These puparia are more or less hidden in the base of young wheat plants and the perfect flies issue as soon as we get settled spring weather, and in fact are issuing in southern latitudes at the present time. The sexes are easily distinguished by the simpler antennæ of the female as compared with those of the male, by the more robust abdomen and extensile ovipositor. She deposits her eggs between the ribs of the blades generally near the base; the young larvæ hatching therefrom suck the substance of the stalk and imbed themselves more or less fully within it. There are two broods annually, and in southern latitudes a tendency to a third one. Few insects have more often been treated of or more fully written about than this, and an added interest has lately been given to it because of its recent introduction into England. The species has long been known to occur upon the continent of Europe and the prevailing belief has been that it was introduced therefrom into the United States during the Revolutionary war by Hessian troops. It was first announced in England some two years ago by Miss. E. A. Ormerod, consulting entomologist of the Royal Agricultural Society, and it has proved more or less injurious and rapidly extended during the past two years, so that at the present time it is found on most portions of the eastern coast extending up into Scotland.

In North America the species has constantly, since the first announcement of its appearance on Long Island, spread farther and farther west with the westward movement of the center of wheat culture, so that at the present time it may be said to extend over nearly the whole wheat area of the United States, except perhaps the extreme northwestern and the southwestern limits, where the excessive dryness of the atmosphere, in the one case, and the excessive heat of summer, in the other, have proved, so far, obstacles to its successful multiplication. For a long time it was unknown on the Pacific coast, but during the past three years it has been quite injurious in parts of California.

Now its advent in England. a century after it was brought to this country, has caused a good deal of discussion, and while I was over there last autumn I found that not only British agriculturists, but the British public generally were intensely interested in the subject and quite agitated as to the prospects in the future.

Three points particularly interest the grain grower as well as scientific men, viz, the date when the insect was actually imported into England, the country it was introduced from, and the prospects from its work in the future.

I had occasion to consider all of these points at some length in the *London Times* for October 17 last, but in this connection have time only to say that as to the first point there is likely to be the same controversy as there has been in reference to the periods of its importation into America, and just as all the facts point to the latter event about the time of the Revolutionary war, so the evidence points conclusively to its very recent advent into England. One of the strongest opponents of the view that the species was imported into this country by Hessians has been Dr. H. A. Hagen, of Cambridge, and though his arguments have some weight from the historic side they are weak from the biologic side, as they do not take into account the exceptional tendency to belated or retarded development which the species exhibits in the puparium state.

There was no way of definitely ascertaining from what country the insect was really introduced into England, but by a study of the parasites which had so far been detected in England. Hence I was urged while there last year to examine such parasites as had been reared there.

This material was submitted by Miss Ormerod, Professor Fream, Lord Walsingham, Mr. O. E. Janson, Mr. Fred. Enock, Mr. F. M. Campbell, and others who interested themselves in the subject and were anxious for determinations.

A study of these parasites enabled me to identify them as *Platygaster minutus* Lind., *Semiotellus nigripes* Lind., *Eupelmus karschii* Lind., *Merisus intermedius* Lind., *Tetrastichus Rileyi* Lind., *Euryscapus saltator* Lind., *Dacnusa senilis* Hal.; and while the material that was placed in my hands will require some little revision of a paper which I have already published on the parasites of the species in America, yet they are all essentially European and point unmistakably to the importation to England from the continent of Europe. The negative evidence, so far as it goes, confirms this, because statistics show that from 2 to 3 per cent. of the straw imported into England comes from America, and the importation has not been made through the chief ports of entry of American vessels, such as Liverpool. In fact the species has not yet been found in Ireland or on the western coast of England, being confined, as already remarked, to the east coast.

In reference to the third point, viz, the future injury that is likely to

be done in England, I may briefly state that on account of the cooler summers and milder winters and the lateness at which wheat is sown in England there is very little danger, in my judgment, of any such injury as we suffer from here, or as the insect causes in portions of continental Europe. In fact it is very injurious only under conditions where two annual generations are pretty uniformly produced, and I am satisfied that in England, as a rule, only one generation will be produced.

THE HOP PLANT-LOUSE.

The next insect which I will say a few words about is the Hop Plant-louse (*Phorodon humuli*), of which we have been able to say for the first time the past year that we now know positively its full life history. I have for some years desired to settle a question that has been mooted among entomologists, as also among hop-growers, viz, the mode of hibernation of the species; for while some of the earliest writers upon aphidology have believed, and even stated, that there was a form of this insect that occurred in autumn on the Damson in Europe, the statement has been as confidently controverted and the fact denied by some of the highest authorities in the family. Hop-growers as a class have generally pooh-poohed the idea. Yet, from my own experience with other species of the family and with their singular life history and migrations from one plant to another, I had for some time felt convinced that *Phorodon humuli* also must have some other winter resting place than the hop vine,

FIG. 30. *Phorodon humuli*. stem-mother, enlarged, head and antenna still more enlarged (original).

FIG. 31. *Phorodon humuli*, first migrant from plum, third generation, enlarged; head at side still more enlarged (original).

and after very careful and persistent investigation, in which I have had the co-operation of several of my assistants, the question has been fully and thoroughly settled.

Fig. 32. *Phorodon humuli*, true sexual female, enlarged (original).

The facts in the life history of this insect, therefore, may be summed up as follows: Hibernating at the present season of the year, the little glossy, black, ovoid eggs of the species are found attached to the terminal twigs, and especially in the more or less protected crevices around the buds, of different varieties and species of Prunus, both wild and cultivated. From this winter-egg there hatches a stem-mother (Fig. 30), which is characterized by being somewhat stouter, with shorter legs and honey tubes than in the individuals of any other generation.

Three parthenogenetic generations are produced upon Prunus, the third becoming winged (Fig. 31). This last is what my late friend Lichtenstein called the *pseudogyna* or migrant, and it instinctively flies to the hop-plant, which is entirely free from attack during the development of the three generations upon Plum. A number of parthenogenetic generations are

Fig. 33. *Phorodon humuli*, male, enlarged (original).

produced upon the Hop until in autumn, and particularly during the month of September winged females are again produced. This is the *pupifera* of Lichtenstein or return migrant, and she instinctively returns to the Plum. Here she at once settles and in the course of a few days, according as the weather permits, produces some three or more young. These are destined never to become winged and are true

sexual females (Fig. 32). Somewhat later, on the Hop, the true winged male (Fig. 33), and the only male of the whole series, is developed, and these males also congregate upon the Plum, on the leaves of which toward the end of the season they may be found pairing with the wingless females, which stock the twigs with the winter eggs (Fig. 34). Such, briefly, is the life history. Twelve generations may be produced during the year, but there is great irregularity in the development of these generations and the return migrant from the Hop is produced at the the end of the season whether from individuals of the fourth or fifth generation, or of the twelfth. As I have remarked elsewhere* "each parthenogenetic female is capable of producing on an average one hundred young (the stem-mother probably being more prolific), at the rate of one to six, or an average of three per day, under favorable conditions. Each generation begins to breed about the eighth day after birth, so that the issue from a single individual easily runs up, in the course of the summer, to trillions. The number of leaves (seven hundred hills, each with two poles and two vines) to an acre of hops, as grown in the United States, will not, on the average, much exceed a million before the period of blooming or burning; so that the issue from a single stem-mother may, under favoring circumstances, blight hundreds of acres in the course of two or three months.

FIG. 34. *Phorodon humuli*, eggs and shriveled skin of female which laid them—enlarged (original).

" While meteorological conditions may materially affect the increase and power for injury of the species, these are far more truly predetermined and influenced by its natural enemies, many of which have been studied and will be described.

" The slight colorational differences, as also the structural differences, including the variation in the tubercles or cornicles on head and basal joints of antennæ, whether upon Plum or Hop, are peculiarities of brood and have no specific importance whatever.

" The exact knowledge thus gained simplifies the protection of the hop plant from Phorodon attack. Preventive measures should consist in destroying the insect on Plum in early spring where the cultivation of this fruit is desired, and the extermination of the wild trees in the woods wherever the hop interest is paramount; also in avoiding the introduction of the pest into new hop countries in the egg state upon plum cuttings or scions. Direct treatment is simplified by the fact that the careful grower is independent of slovenly neighbors, infection from one hop yard to another not taking place."

The bearing of these facts will probably best be brought home to

*Paper read before the British Association, Manchester, September 2, 1887.

you by the statement that hitherto hop-growers have been groping in the dark and working to prevent injuries by applications to the soil. In fact, the English hop growers have been led by their very best authorities to waste their energies in this direction. The importance of the matter will appear when I state that the hop crop, which is quite an important one in some parts of this country, and especially important in some parts of Europe, annually suffers from the ravages of this its worst insect enemy, and some years is rendered a total failure by it. Further, that some parts of this country, as the Pacific coast, are yet free from it and that hop-growers thereby being forewarned may prevent its introduction from the East or from Europe, as there is very little doubt in my mind but that the insect has been introduced from one country to another in the egg-state upon plum scions, as it may easily be transported from place to place in this manner. I had the pleasure during September and the early part of last October to finish up the investigation and follow out the closing scenes in the life history of this species in the county of Kent, England, while some of my assistants were doing the same thing in Herkimer County, New York, and the facts independently obtained correspond in a remarkable manner, thus confirming and strengthening the conclusion which I have indicated to you.

SUMMARY.

All three of the species which I have brought to your notice have been imported to this country from other countries, and this is the case with the vast majority of the worst weeds and insects of American agriculture. I should naturally be led, in closing, to some considerations growing out of this interesting fact; for it is noteworthy that such introduced species often, and indeed as a rule, outstrip the native species in the struggle for existence, and become abnormally destructive to cultivated crops. In America and the other newer, but, geologically speaking, older, parts of the world, as Australia, one reason for this state of things is patent, viz, the fact that the natural enemies of the species are, as a rule, not brought with it, so that it has much freer play in its reproductive powers than it has in its native country where such natural checks occur. But there are other just as potent facts which tend to bring about the greater destructiveness of introduced species in the countries mentioned, and one that has not been fully realized has always struck me with much force. It is this, that most of such species are introduced from Europe or the older civilizations where, on evolutional grounds, it is natural to suppose that they are the very species which have become accustomed to the civilized conditions induced during so many centuries. In other words, the species which most abound and have most successfully accommodated themselves to such artificial conditions, have, in the geologically brief period of man's pre-eminence, acquired advantages over species which have

not been submitted to such environment. The former, when brought into competition with the latter, under such conditions, rapidly outnumber them and get the upperhand.

THE FOOD HABITS OF THE THRIPIDÆ.

By Herbert Osborn, Ames, Iowa.

In general the food habits of all the species in any circumscribed group of animals will be found to agree quite closely, and any departure from such unity of habit will furnish interesting, often important, subjects of study.

In the *Thripidæ* we have a small group of insects remarkably well defined and agreeing so closely in structural characters that we would expect in them very close uniformity in food habits. Nevertheless, there has been wide difference of opinion upon this point, some believing them to be essentially herbivorous, while others have held for all, or some, of the species a carnivorous diet.

In the *Canadian Entomologist* for 1883 (Vol. XV, p. 151), I have presented a brief résumé of the American species, with some notes regarding food habits. Since then I have made such observations as possible and have also collected testimony from various sources, so that it seems to me possible to present sufficient evidence to warrant a conclusion approximating the truth.

Without repeating the substance of my paper in the Canadian Entomologist, I may state in brief the most important sources of evidence there referred to.

Mr. Haliday, whose monograph of the European species has been the foundation for all subsequent work, treats them as herbivorous, as does also Westwood in the "Classification."

In this country Dr. Fitch, Dr. Packard, and Professor Comstock have described species as injurious to plants.

Mr. Walsh held strongly to the belief that they were carnivorous, and I will here state his arguments in full. In the proceedings of the Entomological Society of Philadelphia he says:

> On June 8 I noticed a few imagos of a large Thrip in some galls of *P. caryæfoliæ* which were at that time full of their normal tenants; on June 22 I noticed in galls of the same insect on the same trees many red pupæ, apparently of the same Thrips, which seems to have supplanted or exterminated the *Phylloxeræ*, for almost every gall contained six or seven Thripid pupæ and but very few *Phylloxeræ*.

In the Proceedings of the Entomological Society of Philadelphia (Vol. III, pp. 611–12), he says:

> What is the cause of this phenomenon (the absence of larvæ in Cecidomyian galls) I can not say with certainty, but I suspect that the egg or the very young larvæ of the "gall-gnat" is to a great extent destroyed within the gall by being punctured and sucked by some insect foe; and that that foe probably belongs to Thripidæ.

Authors have hitherto always considered this remarkable family as vegetable-feeding, but from many facts which I have observed, one of which I have recorded (Proc. Ent. Soc. Phila., I, p. 310), I believe that they are generally, if not universally, insectivorous, and that those that occur on the ears of wheat, both in the United States and in Europe, are preying there upon the eggs or the larvæ of the Wheat Midge (*Cec. tritici*), and are consequently not the foes, as has been generally imagined, but the friends of the farmer. In confirmation of these views, it may be remarked that the very same species (*Thrips cerealium*), which has been stated by all European authors to attack the ears of the wheat, was found by Vasali Eandi in Italy "to gnaw the stems of the wheat above the knots and cause the abortion of the ear." (See Westw., Intr., II, p. 4.) Is it probable that the same species should attack the same plant in two such very different parts? I believe that the Italian Thrips were attacking Hessian Flies (*Cec. destructor*) or some such wheat-destroying insects that inhabit "the stem above the knots," and that it was these last and not the Thrips that caused the "abortion of the ear." The Thrips that were supposed to do so much damage in Wisconsin, as related by Dr. Fitch (N. Y. Rep., I, p. 304), were said to attack both the blossoms of the wheat and the blossoms of the clover. But it is not the genera habit of insects to prey at the same time upon two plants which are so widely dis. tinct as wheat and clover—the one Monocotyledonous, the other Dicotyledonousl Even the Polyphagous army-worm refuses to eat clover.

Now, as already stated, I have myself noticed several Thrips in June both in the larva and imago state on the Cecidomyidous gall *S. ænigma*, and have raised the larva to maturity in a breeding-jar in which there was nothing but that gall. Moreover, Dr. Fitch found his *Phlœothrips caryæ* in hickory galls, which are manifestly either closely allied to or identical with the Cecidomyidous hickory gall *Tubicola* O. S., though he doubts whether these galls were produced by the Thrips or by some other insect (N. Y. Rep. II, p. 127), and Osten Sacken observes of the galls of the Cecidomyidous *Lasioptera vitis* O. S. that some of the galls' hollows are often abandoned by their inmates and invaded by numerous Thrips. (Dipt. N. A., p. 201.)

In Practical Entomologist, Vol. I, p. 21, he says:

I do not believe that the Thrips of entomologists are, as has hitherto been universally believed, vegetable feeders; but that, on the contrary, they are cannibal insects, preying upon injurious larvæ, and therefore the friends and not the foes of the agriculturist.

Still further in the Practical Entomologist, Vol. II, p. 50:

Naturalists hitherto had always supposed that these Thrips were vegetable feeders and injurious to plants. In the Proceedings (Entom. Soc. Phil., III, pp. 611, 612) I suggested "that they are generally, if not universally, insectivorous, and that those that occur on the ears of the wheat, both in the United States and in Europe, are preying there upon the eggs or larvæ of the Wheat Midge (*Diplosis tritici*), and are consequently not the foes, as has been generally imagined, but the friends of the farmer." At the conclusion of this passage I gave several reasons for my belief, and I have since found Thrips preying upon the gall-making larvæ of more than twenty different galls, growing on different trees and other plants, so that there is now no manner of doubt in my mind that Thrips is a true cannibal insect. The importance of this discovery may be seen at once. The larvæ of a minute Flea-beetle (*Haltica*) often grieviously infests clover blossoms, feeding upon and destroying a large portion of the seed. A Thrips occurs also sometimes in large numbers on these blossoms.

Hitherto farmers, when they detected Thrips on their clover, had supposed that a new enemy was invading it. Now, when they see the Thrips there, they may go to bed and sleep comfortably, satisfied that the depredations of the real enemy are about to be checked; and in the same way, whenever in wheat fields infested by the larvæ of the Wheat Midge (popularly known in the East as the "Milk Weevil" and in the West as the "Red Weevil") Thrips are discovered in the ears of the infested grain,

the farmer may know that a friend has come to his rescue, and that the Great Author of Nature is saying to the little pest, through the mouth of the minute and almost microscopic insect which He has appointed to do His work, "Thus far shalt thou go, but no farther, and here shall this grievous plague of flies be stayed."

I may remark here that I have found a few Thrips haunting the leaf galls, which have so abounded everywhere, in 1866, on the Clinton grape-vine, and which have been named *vitifoliæ* by Dr. Fitch. There can be but little doubt that they were preying here upon the minute bark-louse, which produces this leaf-gall. I have also noticed them to be very abundant in the flowers of the Bracted Bind-weed (*Calystegia sepium*). As a small plant-feeding beetle (the *Conotelus obscurus* of Erichson) also occurs in great numbers in the same flowers, it is not improbable that the Thrips may feed upon its larvæ.

In speaking of the natural enemies of the Phylloxera, Dr. Riley says (Mo. Rept., VI, pp. 50, 51):

The most efficient is a black species of Fringe-wing or Thrips, with white wings—*Thrips phylloxeræ* of my MS. The egg, which is thrice as large as that of the louse, ellipsoidal, and with a facetted surface, is deposited within the gall among its legitimate inhabitants, and the young Thrips, which differ from their parents not only in lacking wings, but in being of a blood-red color, with only the extremities and the members black, play havoc with the lice. They are active, supple creatures, and turn up menacingly the posterior part of the body when disturbed. They are found in several different kinds of Phylloxera galls, and do more than any other species to keep the leaf-inhabiting grape Phylloxera within bounds.

Mr. Pergande, whose acquaintance with the Thripidæ is very extensive, writes in Psyche (III, p. 369):

That many species of the Thrips are vegetable feeders in some of their stages has long been well known, and I have seen numerous species on all kinds and all parts of plants, and some of these Thrips I have seen in the act of feeding, but I have also observed that not all species have entirely the same habit, and that some in one stage or another are carnivorous. Especially have I noted this to be the case with a species which is frequently found upon the leaves of *Platanus* and upon other plants which are badly infested with *Tetranychus telarius*, upon the adults and young, and probably also upon the eggs, of which these Thrips feed. It may also turn out that two or three species which swarm in great numbers in the blossoms of clover, which are usually full of the eggs and larvæ of *Cecidomyia leguminicola*, are particularly carnivorous, and further observations may prove that they mainly search and feed upon the *Cecidomyia*. I may also mention here that this year, as late as November 14, after several quite cold days, I found for the first time *Heliothrips hæmorrhoidalis* Bouché on apple leaves in the orchard of the United States Department of Agriculture, as lively and active as in hot-houses, where this species was only observed previously. I may also mention the presence of *Heliothrips dracænæ* Heg. in the conservatory of the Department of Agriculture, an insect which is reported as doing immense damage to *Dracænas* in hot-houses in different parts of Europe.

In 1886 Dr. Karl Lindeman published results of his studies on the Thrips in Russia, and treats of five species as infesting various plants.

Thrips secalina Lindeman, a new species infesting and subsisting upon grain and Timothy grass.

Phlœothrips frumentaria Bel., in ears of corn, the larvæ sucking its food from the plant.

Chirothrips antennata Osborn, a species that was first discovered by

the writer in heads of Timothy grass in Iowa, and next recorded by Lindeman as living on the same and other plants at Moscow.

Aptinothrips rufa Hal., he states to subsist upon grasses and compositæ.

Phlœothrips armata Lindeman, is a new species that he describes as affecting *Anthemis tinctoria*, *Chrysanthemum leucanthemum*, and other plants.

Professor Lintner included *Limothrips* (*Thrips*) *tritici* Fitch in his lists of clover insects (Report of New York Agricultural Society for 1881–'82, p. 192), and also mentions a "*Thrips* sp." in the same connection.

In Prof. W. J. Beal's Grasses of North America, Professor Cook, in chapter on insects, page 375, says of Thripidæ:

> The past season I have found three species, one black, one light yellow, and one bright red, all to be very abundant on the clover blossoms, yet I could not see that they were greatly injurious.

Further, page 401 of same work, in regard to grass withering in summer:

> This is more likely due to species of Thrips, three of which I have taken from the culms.

Professor Cook also informs me that Professor Fernald has described the attacks of one species on grass, but I have not the reference at hand; and also that he has dissected Thripidæ, and found their stomachs to contain grains of pollen.

The species referred to as attacking grass may very likely be the same as credited with destroying grass by Professor Comstock, and given the manuscript name of *Limothrips poaphagus*.

Since presenting the statements in my paper published in 1883 I have watched every season the work of the common species at Ames, and especially in clover heads have noted the operations of thousands of individuals. In all these observations I have not seen a single example of *Cecidomyia* larva or anything to indicate attack upon these or any other insects. On the contrary, as recorded in my report to Professor Riley for 1887 (Rep. Dep. Ag., 1887), I have seen the Thripidæ fall a prey to the Insidious Flower Bug (*Triphleps insidiosus*). I feel pretty well convinced, therefore, that whatever they may do when *Cecidomyia* larvæ are present, they must be able to live without them, and it seems almost certain that they subsist upon the tissues of the clover itself, since they occur in all stages of development. I have also observed a species resembling *tritici* in Wild Morning-glory blossoms, Fitch's *Phlœothrips mali* on grape leaves, and what is presumably his *Coleothrips trifasciata* (though my specimens differ in certain characters given generic importance) on a common weed, and in none of these species have I seen evidence of feeding upon anything but the plant or its secretions. Last summer (1887) I collected an undescribed species from the leaves of hop in Wisconsin. Individuals of various sizes, mostly larvæ, being found more or less clustered together on the leaves, and there seemed to be

scarcely an opportunity to doubt that they were subsisting upon the plant. A species which agrees with *P. nigra* Osborn in every respect, so far as I can see, but in larval and pupal characters, occurs commonly on Mullein, and this species I have bred from egg to imago with no other food than that received from the mullein leaf, the injury to the leaf showing as yellow blotches, similar to those produced by *Tetranychus telarius.* I can therefore state positively that this species can mature upon purely vegetable diet. The leaves were kept in water in my office under constant observation, and the Thrips developed to maturity on the same leaves that the eggs were deposited upon by the adults.

The following summary of the species whose food habits have been noted will show the state of our knowledge so far as the different species are concerned and the records of which have come to my notice:

Phlœothrips mali Fitch, gouging into young apples (Fitch).
Phlœothrips caryæ Fitch, in hickory galls, food ? (Fitch).
Phlœothrips nigra Osborn, lives in clover heads.
Phlœothrips sp. near *nigra*, feeding on leaves and blossoms of Mullein.
Phlœothrips frumentaria Bel., larvæ suck grain in the ear (Lindeman).
Phlœothrips armata Lindeman, affecting Compositæ and Grasses (Lindeman).
Thrips tritici Fitch, injurious to wheat and clover (Fitch), attacking styles of apple blossoms (Osborn), injuring strawberry (various writers).
Thrips cerealium Hal., very destructive to wheat in Europe (Kirby, Curtis, *et al.*).
Thrips minutissimus L., infests potato (Curtis).
Thrips ochraceous, destructive to melons, etc. (Westwood, Curtis).
Thrips striatus Osborn, "destroys onion plants" (Packard).*
Thrips sp., very injurious to olive trees (Westwood).
Thrips sp., living on leaves of hop.
Limothrips poaphagus Comstock MS., affecting grass (Comstock *et al.*).
Limothrips graminea Pergande MS., affects corn, wheat, and grass (Pergande, Forbes *in lit.*).
Heliothrips hæmorrhoidalis Bouché, injurious in greenhouses and on apple.
Heliothrips dracænæ, Heg., reported very destructive in hot-houses (Pergande).
Heliothrips adonidum =*dracænæ* (?) infests greenhouse plants (Westwood).
Chirothrips antennata Osborn, in timothy heads (Osborn), timothy, wheat, and rye (Lindeman).
Aptinothrips rufa, subsisting upon Grass and Compositæ (Lindeman).
Coleothrips trifasciata Fitch, injurious to wheat (Fitch, Packard).

The conclusion to be drawn from the evidence at hand seems to me as follows:

That the Thripidæ as a group are normally herbivorous, and their presence on cultivated plants is a source of danger.

That they feed mainly on the exuded nectar or secretions of plants, when these are abundant, and on pollen, and at such times may do little or no damage.

That they will upon occasion attack the tissues of the leaves or the essential parts of the blossom and pierce them for their contents, and at such times may cause serious damage.

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* Packard also mentions this species (Entom. for Beginners, p. 197) as injurious to wheat, but I think it must be an error, and *Thrips tritici* intended instead.

That of the recorded species there are two at least which must be looked upon as carnivorous, in certain stages at least. The species here recorded by Mr. Walsh and Dr. Riley as infesting Phylloxera galls, and the one recorded by Mr. Pergande as destroying *Tetranychus*.

The attacks of Thrips upon *Phylloxeræ* seem explicable to me without supposing them, as Mr. Walsh did, essentially carnivorous. For, supposing that they first entered the gall to feed upon the exuded sap there, or the soft tissues so available for their use, it would not be a great change for them to feed upon the exudations from the lice, and later, if pressed for food, upon the lice themselves. This view may be erroneous, but it seems to me reasonable, though I have been unable to make observations to confirm it, because in all the galls of *Phylloxeræ* I have examined I have not as yet found Thrips present. It seems to me that we must consider the carnivorous diet, where present, as an acquired habit, or one but recently developed in the species, and that for all species upon which no positive observations have been made that the only safe ground to take is that they are a source of danger to cultivated plants; that is, to believe them injurious until they are proven beneficial.

The difficulty of making positive observations on the food habits of these minute creatures makes a general law regarding their habits very desirable, and I hope that evidence may accumulate which will enable us to determine still more certainly what is the actual relation which these insects bear to other organisms.

EXTRACTS FROM CORRESPONDENCE.

Danger to Human Beings from Use of Paris Green.

Thanks for Nos. 1 and 2 of "Insect Life." Your publications are great public educators and special aids to farmers. A more thorough knowledge of our friends and foes among insects and birds would increase our farm products. We hope you may find-out insecticides which are less dangerous to humanity than arsenic. Two cases of serious illness, but not fatal, have occurred in our neighborhood—one from eating strawberries planted alternately with potatoes which had been dusted with Paris green, and the other from eating raspberries adjoining the potato patch, from which the poison had blown. We hope that Congress will make all necessary appropriations for the carrying on of the good work.—[R. Bingham, Camden, N. J., September 22, 1888.

Reply.—* * * I am glad to get the account of the two cases of poisoning from the treatment of potatoes by Paris green, and agree with you that a less dangerous remedy would be good. With proper care, however, there is very little danger, and in both the instances which you mention the application was evidently very carelessly made.—[September 25, 1888.]

The Clover Seed-midge in Ohio.

Will you please tell me the name of the "worms" that I send by the same mail with this letter? They were in the second crop of clover this season on my brother's farm. He would cut enough of the clover in the morning to feed twelve cows at

night, and let it lie in the wagon all day, and when he took it out at night the wagon box would be literally pink with them, they were so numerous. This was about the middle of August. I was away from home at the time, but he put some of them in a box to keep until I returned. I thought perhaps they were so well preserved you could identify them. * * * Last year we had the Chinch Bug, but I have only seen a very few of them this year.—[Miss E. J. Phillips, Chagrin Falls, Cuyahoga County, Ohio, September 21, 1888.

REPLY.—* * * The insect which you send this time is a common Clover Seed-Midge (*Cecidomyia leguminicola* Lintner). This insect was first discovered by Prof. J. A. Lintner in 1878 in New York State, but has since been found as far West as Wisconsin and north into Canada and south into Northern Virginia, so it is not at all strange that it should occur in your vicinity. It is particularly destructive to the clover-seed crop, but does not injure the quality of the hay. The insect was treated in the Annual Reports of this Department for 1878 and 1879 and also in Bulletin 12 of this Division. A very satisfactory remedy consists in cutting the first crop of clover from two to three weeks before the ordinary time, thus allowing that generation of the maggots no opportunity to mature.—[September 25, 1888.]

Formula for a Buffalo Gnat Application.

As I planted on the Mississippi River many years ago, I think my experience with Buffalo Gnats may be useful to others, as I never lost by them.

In the fall I always caught a quantity of fish with a seine, and got a quantity of oil from the offal. Early in the spring I put 5 pounds of roll sulphur in a large iron pot, and when melted poured in 2 gallons of pine-tar, stirring and taking the pot from the fire, and stirred in 5 gallons of fish oil until it was cool.

When the season came for gnats, each plowman was provided with a gourd containing a pint or two, which he hung up at the end of his row, and was instructed to examine the throat just behind the jaw, where they first attack. As soon as he observed any gnats, he passed the alarm along the line, and every plowman smeared the mixture over the nostrils, throat, and flanks of his animal. I protected my work-oxen the same way. The stock cattle were protected by smoke, or by lying on the sand-bars left by the river. I always had everything ready for the gnats, and as I protected my animals instantly I never had any animals injured by them.—[P. H. Skipwith, Oxford, Miss., August 30, 1887.

The Acid Secretion of Notodonta Concinna.

In rearing a brood of caterpillars, figured in Harris' work as "Red Hump" (*Notodonta concinna*), I discovered that they had the power to emit quite a quantity of strong hydrochloric acid, strong enough to be decidedly corrosive to the skin and easily perceptible in the atmosphere. This act was often performed when suddenly disturbed, and was noticed only in the older ones, though it might have been present when younger, but, if so, was unnoticed. As I find no mention of this power in any of the works at my disposal, I referred the matter to you, feeling, if not known before, you would be interested in it.—[Charles S. Denham, East Pepperell, Mass., August 22, 1887.

REPLY.—* * * So far as we can learn this acid secretion has not been noticed in print in reference to this particular species; but it is well known that many of the Philodontid larvæ allied to it have the power of ejecting from glands between the head and first segment such an acid liquid or vapor. A number of articles have appeared in the last two years in European entomological magazines in reference to this secretion, and we have noticed it in some four or five of our native species. * * *

Out-of-door Hibernation of Lecanium hemisphæricum in Pennsylvania.

About a year ago, I sent to the Department of Agriculture specimens of *Lecanium* which were pronounced *hemisphœricum*, which had infested an outdoor cucurbitous plant, from about the 1st of July until late in October, when the plant was removed (1886). After the plant (or plants) was removed I observed that about a dozen of the adult females had located on an upright support of the arbor, where they remained all winter. They were not examined until late in the following spring (1887), perhaps the 1st of May, and then I found them all vacated. The plants came up in great numbers in the spring, but my women folk considered them a nuisance and removed every one of them from the premises. On the spot formerly occupied by the vines my wife set some foreign ferns, where they remained until the advent of frost this fall, when I noticed that they were almost as badly infested as the *Echinocystis* was last season. I also found that a Japanese Quince (*Cydonia japonica*), over which these vines were permitted to run last year, were similarly infested. Now, I desire you to determine whether these are all the same species. Because, if they are, then *Lecanium hemisphœricum* is capable of an outdoor survival of the winter of South Pennsylvania, which may be a matter of some importance to know.

It may be pertinent to the subject to state that we have had these ferns in our possession for the past seven or eight years, keeping them in the house during winter, and setting them out during the summer, and I have never noticed a single specimen of *Lecanium*, or any other insect, on them until the present season, and I am confident that I would have noticed them sometime during the seven years had they been present. My observations last year demonstrated that this insect multiplies prodigiously on a curcubitaceous plant, and if it can endure the outdoor winter with impunity it may possess possibilities that can not be entirely ignored. * * * —[S. S. Rathvon, Lancaster, Pa., October 29, 1887.

REPLY.— * * * I recollect perfectly your correspondence of a year ago in reference to the *Lecanium hemisphœricum* and a note of the singular fact of its outdoor occurrence was made at the time for publication in an early bulletin. It has not, however, been published as yet, and your present observation will form an interesting postscript to it. An examination of the specimens sent this time upon the *fern* shows that they are *Lecanium hemisphœricum*, but those upon the twig of Japanese Quince belong to a different species—*Lecanium persicæ*. The latter species has long been known to infest peach and plum out of doors as far north as the latitude of New York City, but the wintering of *hemisphœricum* under the circumstances is of great interest. I have never seen this species even in the latitude of Washington upon anything but hot-house plants.—[November 2, 1887.]

The Introduction of Lestophonus iceryæ*.

* * * A Monophlœbus which was left in San Mateo on a Cherry Laurel badly infested, showed by a recent visit numerous holes, and judging from their condition two months previous when seen, at least 50 or 60 flies had hatched, all probably a month after being placed there. Of course it was too early to expect any of their progeny to appear, but if successful I shall look for them. * * *—[W. G. Klee, 220 Sutter Street, San Francisco, Cal., October 4, 1888.

A House infested with Psocidæ.

In March, 1886, a lady here bought a new mattress composed of hair and corn-husks. It was used daily until the following August, when the family left home for a six weeks' vacation. A day or two after the return in September, there were noticed on a pair of shoes, which had not been in recent use, several little colorless creatures resembling the common "book-lice" in appearance, some of which have been sent to you. Continuing the examination, what was her horror to find the under surface of

* See Insect Life, No. 1, p. 21.

the lower sheet and the upper surface of the mattress almost alive with the insects. To use her own language: "A pin-point could not have been put down without touching one or more of the bugs." Further search showed a very unpleasant state of affairs. The walls of the room were so covered with the insects that a sweep of the hand removed them by the thousand, and the other rooms in the house were almost as badly infested. The bureau drawers were swarming with them. They were behind the pictures and between the pictures and the glass in crawling cohorts. They were under everything and in everything. To say that the neat housekeeper was beside herself is putting it mildly indeed.

The mattress was removed and examined. Without exaggeration it contained millions. Then came the house-cleaning. The walls and floors were washed with solution of borax and corrosive sublimate. Pyrethrum powder was freely used. All the carpets were sent to the steam-cleaners. The furniture was beaten, cleaned, and varnished. The struggle was continued for a year with all the persistence of an extraordinarily neat housekeeper. The insects had the best of it, and held possession in diminished numbers. The family then removed to a hotel, while for days the closed house was fumigated by burning sulphur, and the scrubbing processes were afterwards repeated. The insects were again diminished, but the least relaxation in the struggle was soon followed by an increase of the enemy. Again the house was vacated, and the closed rooms were subjected to the vapor of benzine, basins and pans being filled and the fluid left to evaporate. The scrubbing processes were again repeated, and the lady began to hope that the benzine had been the concluding touch, although she continued to have the creatures on her mind and to watch for them. Her hopes were vain. The insects are still in the house, two years after the removal of the mattress, and in spite of all the harsh treatment they have received. These *Psocidæ* at least seem incapable of taking a hint. Their numbers are of course greatly reduced, but they still march over the walls and hide in dark places. If you can suggest a remedy that has not been tried, it will be accepted gratefully by that troubled lady, and faithfully employed.

As I close my letter it occurs to me that the house has been built less than three years, and that the present neat occupants are the only ones it has ever had; also that, in addition to the treatment detailed above, the house has been subjected to the fumes of burning charcoal.

If anything further is needed to show how tenacious of life these little creatures are, I may add that in order to mount them for microscopical examination they were immersed in liquefied crystals of carbolic acid, where they continued alive for several seconds.—[Alfred C. Stokes, Trenton, N. J., October 8, 1888.

NOTE.—The specimens received were all immature, so that it was impossible to determine the species. The insect belonged to the Psocidæ, but apparently not to the true genus *Psocus*.

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX, WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

BY LORD WALSINGHAM.

[*Continued from page* 117.]

INCURVARIA Haw.

Incurvaria punctiferella sp. n.

Antennæ, about half the length of the fore-wings: straw-colored at base, brownish beyond.

Palpi, very short, depressed; apical joint half the length of the second joint.

Head and thorax, straw-colored.

Fore-wings, pale, straw-yellow, with from 18 to 20 small chocolate-brown spots, somewhat varying in size, number, and distribution; not arranged in rows, except in so far as those on the outer half of the wing have a tendency to exhibit two oblique lines running parallel to the apical margin; the base of the costa tinged with chocolate-brown. Under side, brownish with pale cilia.

Head-wings and cilia, cinereous gray. Under side, pale grayish.

Abdomen, cinerous; uncus, short, obtuse, apex curved over in a semicircular form; lateral claspers, projecting nearly their whole length beyond the uncus, elongate, upturned, the upper angle of the posterior margin turned inwards, the margin itself rather oblique, with a sharp, short, projecting point at its lower angle; towards the base, the whole lower edge of the claspers is turned under and inwards almost at right angles with its outer surface, which itself appears to be of about equal width throughout.

Exp. al., 15^{mm}.

Habitat, Rouge River, southern Oregon, May 7, 1872; Mendocino County, Cal., May, 1871.

Types, ♂ ♀, *Mus. Wlsm.*

Incurvaria solenobiella Wlsm.

Abdomen, uncus short and obtuse; lateral claspers bulged on their outer sides, upturned posteriorly and pointed inwards at the apex; they are much wider in the middle than at the ends; the line of their lower edge is somewhat undulating, with a faint indication of a projecting point posteriorly. They differ very decidedly in form from those of *punctiferella* Wlsm.

Incurvaria politella sp. n.

Antennæ, grayish-fuscous, pubescent in the ♂.

Palpi, mouse-gray.

Head, mouse-gray, sometimes paler towards the thorax.

Thorax, shining, grayish.

Fore-wings, shining, pale grayish, sometimes with a slight æneous tinge, especially in the ♀; the æneous tinge is evenly diffused over the wing-surface; cilia gray along their base, tips whitish.

Hind-wings, gray, rather darker than the fore-wings, with a slight purplish iridescence.

Abdomen, pale grayish-fuscous; uncus, short and obtuse; lateral claspers elongate, wider at the base than apex, with a small projecting excrescence at their upper edge, close to the base, and a well-developed tooth projecting inwards from halfway along their lower edge; the posterior ends are rounded and somewhat turned upwards.

Legs, pale gray.

Exp. al., ♂ 17^{mm}, ♀ $14–15^{mm}$.

Habitat, The Dalles, Oregon, April 21, 1872, and Rouge River, Oregon, May 7, 1872.

Types, ♂ ♀, *Mus. Wlsm.*

Incurvaria humilis sp. n.

This is a small, inconspicuous, unicolorous species, of a uniform grayish-brown color. The hind-wings very slightly darker than the fore-wings, owing to an excess of the gray tinge. The legs are scarcely paler. The abdomen is of the same color as the fore-wings. The genital organs are peculiar; a short, obtuse, straight uncus, not bent over, is overshadowed by the strongly upturned lateral claspers, which have the appearance of hooks on either side; they have a slight tooth-like projection below, and a small excrescence above at their base, but are of a totally different shape from those of the larger allied species.

Exp. al., 13–14^{mm}.
Habitat, Crescent City, Cal., 19–21 June, 1872.
Type, ♂, *Mus. Wlsm.*

Incurvaria æenescens sp. n.

Antennæ, whitish at the base, tending to fuscous beyond.
Palpi, whitish.
Head, yellowish-white.
Thorax, fore-wings, and cilia, unicolorous, pale golden-brown.
Hind-wings, purplish-gray; cilia gray.
Abdomen, grayish; lateral claspers, elongate, triangular, upturned, deeply excised beneath, near their base, and with an inwardly projecting short point at their lower extremity; uncus short, obtuse, projected but not hooked.
Exp. al., ♂ 14^{mm}, ♀ 12–13^{mm}.
Habitat, Rogue River, Oregon.
Types, ♂ ♀, *Mus. Wlsm.*
One male, four females, May 7, 1872.

Incurvaria labradoriella Clem.

The type of this species in the collection of the American Entomological Society at Philadelphia had only *one* fore-wing and *one* hind-wing remaining in 1871, and I was somewhat doubtful whether it was a true *Incurvaria*. I have had no recent opportunity of examining the specimen.

Incurvaria acerifoliella Fitch.

The neuration of this species differs from that of the typical *Incurvariæ*, in that veins 5 and 6 of the hind-wings arise from the same stem. The case-bearing habits of the larvæ, rather than the structural appearance of the imago, probably influenced Clemens and Chambers in placing it finally in this genus.

Incurvaria mediostriatella Clem.

=*Lecithocera? flavistrigella* Wlsm.
When describing *Lecithocera? flavistrigella* I was practically unacquainted with *Incurvaria mediostriatella* Clem. The type examined by me in 1871 having only two wings remaining and these much worn, I failed to recognize my species by the description, and was guided chiefly by the long and stout antennæ in placing it in the genus *Lecithocera.* I have now examined the neuration of a specimen and am bound to admit that it does not belong properly to that genus. The apical vein of the fore-wing is furcate near the base, as stated by Clemens, and in this respect it differs from the type of the genus in which he has placed it; nevertheless, I think that the position is approximately correct.

ŒCOPHORA Latr.

Œcophora thoracella sp. n.

Palpi, 2nd joint pale ochreous, shaded with fuscous externally on its basal half: apical joint brownish-fuscous with some pale ochreous scales at about the middle and apex.
Head and face, pale ochreous, shaded with brownish-fuscous above.

Thorax, brownish-fuscous, with a faint purplish tinge, posteriorly fringed with whitish-ochreous.

Fore-wings, remarkably narrow in proportion to their length for this genus, whitish-ochreous; a basal patch, wider on the costal than on the dorsal margin, of a brownish-fuscous color, is followed by a small triangular patch of the same color immediately before the middle of the wing, and this is scarcely separated by a short space on the costa, from a larger patch of the same form immediately beyond the middle; the lower points of these two triangular patches are directed obliquely outwards, at the same angle as that followed by the dorsal extension of the basal patch; the apical portion of the wing is entirely whitish-ochreous with a few scattered brownish scales about the base of the cilia; cilia whitish-ochreous.

Hind-wings, shining, whitish; cilia whitish-ochreous.

Abdomen, shining, pale grayish-ochreous.

Exp. al, 10^{mm}.

Habitat, Colorado.

Type, ♀, *Mus. Wlsm.*

A single female taken by the late H. K. Morrison.

Œcophora dimidiella sp. n.

Antennæ, brown, faintly barred with whitish.

Palpi, dark brown; apical joint tinged with yellowish towards the apex.

Tongue, brown, clothed with brown scales on the basal half; apical half naked, yellowish.

Head, shining, yellowish.

Thorax, deep brown.

Fore-wings, deep brown, with several paler patches; the 1st and most conspicuous lies partly above and partly below the fold, reaching to the dorsal margin at about the basal third of the wing; this is shining pale yellowish (silvery-white wherever the scales have been abraded); on the middle of the costal margin is a smaller silvery-white spot followed by a similar spot at the commencement of the costal cilia; the lower end of the outer spot is bright yellow, it terminates somewhat obliquely before reaching the middle of the wing, its apex being directed towards a similar mixed silvery-white and yellow spot which lies at the anal angle; cilia dark brown; the apical portion of the wing has a somewhat irrorated appearance in the specimen before me (perhaps owing to the abrasion of some of the deep brown scales).

Hind-wings and cilia, dull brown, slightly paler than the fore-wings.

Abdomen, deep brown.

Legs, dull brown, scarcely paler about the tarsal joints.

Exp. al., 16^{mm}.

Habitat, Sonoma County, Cal., May 19, 1871, two females; male, Lake Tahoe, Osten-Sacken, and male, Manitou, Colo. Osten-Sacken (Zell. Coll.).

Type, ♀, *Mus. Wlsm.*

Œcophora coloradella sp. n.

Antennæ, grayish-brown; faintly spotted with paler scales above.

Palpi, brown; whitish on their inner sides; a few paler scales about the outside of the apical joint and at the base of the second joint.

Head, yellowish.

Tongue, whitish.

Thorax, grayish-brown, with a pale streak on each side, the two meeting posteriorly at the base.

Fore-wings, elongate, widened outwardly; costa slightly bulged at the base; straight beyond; apex somewhat depressed, apical margin very oblique, scarcely convex; grayish-brown, dusted throughout with whitish scales; a conspicuous pale-yellow crescent-shaped blotch at the commencement of the dorsal cilia; cilia grayish-brown; neuration very peculiar; the apical vein reaches the costal margin immediately above the apex, and from before its middle sends to the costa a forked branch.

Hind-wings and cilia, pale grayish-brown; veins six and seven parallel, three and four from a point.

Abdomen and legs, pale grayish-brown.

Exp. al., 19 ^{mm}.

Habitat, Colorado.

Type, ♂, *Mus. Wlsm.*

A single specimen given me by Mons. Ragonot.

Œcophora pseudospretella Stn.

It is curious that this widely distributed and far too common species should not have been hitherto recorded from the United States. Zeller had four specimens from Washington Territory and I have received it from Vancouver and taken it in California. It has apparently been overlooked in the Eastern States.

I have also a unicolorous bronzy-brown species which should undoubtedly be placed in this genus, but the palpi are broken, and I prefer to wait for better specimens before describing it.

Psecadia zelleriella Chamb.

I feel confident from a careful examination of Chambers's descriptions of his *Hyponomeuta zelleriella* and his *Hyponomeuta texanella* that these two supposed species are one and the same; both descriptions agree perfectly with specimens in my own collection.

The description of *zelleriella*, though earlier than that of *texanella*, is more minute and complete. I have not seen the types.

It is important in this connection to remember that Chambers has also described an *Anesychia texanella* from the same locality. This is evidently a distinct species, and one with which I am not acquainted. His *Hyponomeuta texanella* is obviously a true *Psecadia*, but as it must be dropped in favor of the prior name, *zelleriella*, no confusion need arise from retaining his *Anesychia texanella*, which should also be placed in this genus.

Psecadia discostrigella Chamb.

= *subcœrulea* Wlsm.

When describing *subcœrulea* I was unacquainted with Chambers's *Anesychia discostrigella*, except by the description. A comparison of a series of both species has convinced me that the specimens from Arizona, Utah, and Colorado, which agree with my figure of Chambers's type (in the Museum of the Peabody Academy of Sciences, Salem, Mass.,) are merely darker forms of my Californian species, the name of which must be suppressed as a synonym of *discostrigella*.

Psecadia marmorea sp. n.

Antennæ, brownish, fuscous.

Palpi, recurved, banded with white and brownish fuscous; second joint with a broad brownish fuscous band and a spot of the same color, more strongly marked on the outer than on the inner side; apical joint with two brownish fuscous bands of about equal width on both sides, having the extreme apex and a belt in the middle of the joint white.

Head, whitish, with a conspicuous white spot above the juncture with the thorax; face grayish.

Thorax, white, with four fuscous spots posteriorly: one behind each of the patagia and two on the posterior margin; there is also a similar spot on the anterior portion of the thorax, but the specimen before me is somewhat injured by the pin.

Fore-wings, white, with an irregular brownish fuscous band stretching from the base to the apex, interrupted on the costal margin by two white patches, the second and larger of which is immediateiy beyond the middle of the wing, and contains a single brownish fuscous spot; the brownish fuscous band occupies more especially the costal half of the wing, but encroaches on the white dorsal half by a slight somewhat triangular projection near the base and a larger projection of the same shape about the middle, between and below which is a single circular fuscous spot; immediately above the anal angle are two semi-detached brownish fuscous patches, followed at a short interval by a marginal series of seven dark fuscous spots, extending around the apex of the wing, the upper two being clearly projected upon the white space about the apex, which forms, as it were, another interruption to the fuscous band; cilia above the apex white, below it to the middle of the apical margin brownish fuscous, below which to the anal angle they are again white.

Hind-wings and cilia, pale fawn-gray.

Abdomen, grayish-ochreous; anal tuft ochreous.

Legs, grayish, with some brownish fucous bands across the tarsi.

Exp. al., 21mm.

Habitat, Arizona.

Type, ♂, *Mus. Wlsm.*

A single male in good condition received from Professor Riley, is nearly allied to *Anesychia hagenella* Chamb., but differs in the interruption by the white costal patches of the dark upper half of the wings, as well as in other minor particulars of markings and in the number of the marginal spots.

Psecadia fuscipedella sp. n.

Palpi, grayish fuscous.

Head and antennæ, dull leaden gray.

Thorax, dull leaden gray, with six black spots in two lines converging posteriorly; the first pair at the base of the patagia; second pair nearer to each other at about the middle; third pair nearer still, at the base.

Fore-wings, dull leaden gray, with four black spots; one at the end of the cell; one before it, above the middle of the wing; a smaller one on the fold slightly nearer to the base; and one still nearer to the base below the fold; on the apical margin, and distributed around the apex and anal angle, on the costal and dorsal margins are from nine to eleven small black spots at the base of the dull leaden cilia.

Hind-wings, scarcely paler.

Abdomen, bright ochreous.

Legs, anterior and median grayish fuscous; posterior bright ochreous with the femora tinged with gray, and tarsi dark fuscous tinged with ochreous at the joints.

Exp. al., 21mm.

Habitat, North Carolina.

Type, ♀, *Mus. Wlsm.*

A single female in good condition received from the late H. K. Morrison.

(*To be continued.*)

GENERAL NOTES.

A RECENT BRITISH ENTOMOLOGICAL CIRCULAR.

The Agricultural Department of Great Britain has just issued a three-page circular, probably written by Mr. Whitehead, upon the subject of caterpillars upon fruit trees. Two groups of caterpillars are considered, the one group including the Winter Moth (*Cheimatobia brumata*), the Pale Brindled Beauty (*Phigalia pilosaria*), the Mottled Umber (*Hybernia defoliaria*), and *Hybernia aurantiaria*, all having wingless females and susceptible to the same remedies. The other group includes three insects of more normal habits, viz: The Lackey Moth (*Clisiocampa neustria*), the Ermine Moth (*Hyponomeuta padella*), and the Figure-of-eight Moth (*Diloba cæruleocephala*). The life history of all these species is of course well known in England, and nothing new is suggested in the circular in the way of remedies. The Canker Worm tree-guard of American pattern is recommended for the insects of the first group, while for the second group clean cultivation around the tree, the denuding of the trunk and lower limbs of their outer bark, and the application of soapy and oily compositions and of paraffine and carbolic acid, and the throwing of finely-powdered quicklime on the trees during winter after an attack are the only remedies recommended. No notice is taken of the arsenical mixtures now so popular in this country.

TWO SUGGESTIONS TO STUDENTS OF ENTOMOLOGY.

Some years ago we used the following method for studying the venation of the wings of small *Lepidoptera*. We have told it since to many friends, but believe it has not been published. It is in some respects preferable to the so-called "Dimmock process" and particularly as a time-saver. It is also in this respect preferable to denudation with a brush. The wing is removed and mounted upon a slide in Canada balsam, which should be preferably rather thick. The slide is then held over the flame of an alcohol lamp until the balsam spreads well over the wing. Just as it is about to enter the veins, however, the slide is placed upon ice, or, if in the winter time, outside the window for a few moments. This thickens the balsam immediately and prevents it from entering the veins, which remain permanently filled with air and appear black with transmitted light. With a little practice one soon becomes expert enough to remove the slide and cool it at just the right time, when the scales will have been rendered nearly transparent by the balsam while the veins remain filled with air. We have done this satisfactorily not only with Tortricidæ and Tineidæ, but with Noctuids of the size of *Aletia* and *Leucania*. The mounts are permanent, and we have some which have remained unchanged since 1880. Professor Riley had for some years before this been in the habit of mounting wings in balsam, in which of course the scales cleared after a time.

With Aphids and Coccids, which are covered with an abundant waxy secretion which can not be readily brushed away, we have adopted the plan of melting the wax. We place the insect on a bit of platinum foil and pass it once over the flame of the alcohol lamp. The wax melts at a surprisingly low temperature and leaves the insect perfectly clean for study. This method is particularly of use in the removal of the waxy cocoon of the pupæ of male Coccidæ, and is quicker and more thorough than the use of any of the chemical wax solvents which we have tried.—L. O. H.

THE RELATION OF ANTS TO THE CORN APHIS.

In the August number of the American Naturalist Professor Comstock criticises my note* on the Corn Aphis (*Rhopalosiphum maidis*), as follows:

> After narrating several experiments, clearly showing that the ants collect the plant-lice and carry them to the roots of the corn, Mr. Webster makes the following remarkable statement: "These observations led me to conclude * * * that ants, of which three species attend these plant-lice, viz, *Lasius flavus*, *Formica schaufussii*, and *F. fusca*, are not in the least responsible for their distribution over the fields, * * *." We do not think the conclusions of Professor Forbes can be set aside in this way.

My critic will, possibly, pardon me for suggesting that there is nothing remarkable in the statement referred to, nor are the observations of any one set aside. The position taken is simply this:

The Corn Plant-louse owes its distribution to the winged migratory broods, of whose ultimate destination the ants can have no conception and as little control over their movements. The number of individuals may be largely increased through the influence of ants, but there is nothing to indicate that their influence directs the movements of the winged generation. Nor do we see that the ants are any more accountable for the appearance of these winged females in any particular field than is the farmer who produces the corn responsible for its appearance in foreign markets when he disposes of his crop to a local dealer.

In our notice we gave observations showing that as soon as a winged viviparous female alighted on a corn plant and was found by an ant the latter took her in charge, placing her on the roots of the plant, where her progeny were fostered and cared for; that this offspring constituted the generation which was the most destructive to the corn crop; that only in cases of dire necessity were these offspring removed, and all of our attempts to force their removal by the application of substances supposed to be distasteful resulted in failures.

That ants collect the eggs and young of Aphides, carry them to their homes, and even place the young on their food plants, no one can reasonably doubt. But to say that this proves that the Aphides are wholly dependent on the ants for either their existence or diffusion is rather a sweeping assertion.

* Report Commissioner Agriculture 1887, pp. 148–9.

On two occasions we have observed the winged viviparous females of the Corn Plant-louse, unattended by ants, giving birth to her young on the stems of young corn, below the surface of the ground, the soil being very mellow, and there appears to be no good reason for disbelieving that at least some of these young might have survived. There seems room to doubt, also, that without the aid of ants at least a few young hatching from the eggs might reach their food and survive, although careful experiments had failed to make them do so. Nature has ways of her own of doing things, and in attempting to counterfeit them the most careful experimenter will often find himself at fault.—[F. M. Webster.

INSECTS INTRODUCED INTO CHILI.

Of considerable general interest is a paper by Dr. R. A. Philippi on the changes in the fauna of Chili caused by man* in which he discusses and enumerates the animals that have been voluntarily or involuntarily introduced by man into that country. The paper extends over the whole animal kingdom and teems with interesting details, but we can here only refer to the insects.†

The intentional importations comprise the useful insects, viz: the honey-bee and the silk-worm. The former was introduced in 1848 (the Italian race) and greatly flourishes now in the whole state, so that Chili exports now a large amount of honey and wax. Sericulture was for some time successfully carried on, encouraged by Government subsidy. The climate is eminently fit for this industry, since the mulberry grows finely in the whole country, and since it never rains in the season when the worms are fed. However, a new secretary of agriculture had no interest in the subject; the Government subsidy was withdrawn, the mulberry plantations were cut down, and at present silk raising may be said to have been entirely abandoned even by private persons. The introduction of the Cochenille insect has never been attempted, although it would no doubt flourish in the northern part of Chili.

Coming to the injurious insects, the following have or have not been introduced:

The Phylloxera has not yet reached Chili, but the Apple-blight (*Schizoneura lanigera*) has made its home in this country, having been intro-

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*Ueber die Veränderungen welche der Mensch in der Fauna Chiles bewirkt hat. Festschrift des Vereins für Naturkunde zu Cassel zur Feier seines fünfzigjährigen Bestehens Cassel, 1866, pp. 1–20.

†All these insects are immigrants from Europe and no North American insects have hitherto been introduced into Chili. The Coleoptera we mentioned in the October number (p. 118) as being common to both North America and Chili are not importations, but represent a very ancient natural distribution. In fact all animals mentioned by Dr. Philippi are importations from Europe except the California quail (*Ortyx californica*) which has run wild in the vicinity of Valparaiso, and there is further strong evidence that the *Canis Ingæ* of Peru and northern Chili originates from the North American *Canis occidentalis* or *C. latrans*.

duced about thirty years ago with apple trees from France. It spread rapidly and developed an extraordinary destructive power, so as to seriously threaten the important apple industry of the province of Valdivia. But fortunately the first shock of the invasion was the worst, and the disease has lost in intensity, although there is even now hardly a single apple tree in the country which is free of this pest.

Various species of Coccidæ are now acclimatized in Chili, but most of them affect only the plants upon which they were introduced. Thus we find in Chili *Coccus adonidum*, *C. hesperidum*, *Aspidiotus rosæ*, *A. nerii*. *Aspidiotus lauri* injuriously affects in central Chili the Olive trees and many other plants with leathery leaves, *e. g.*, *Myrtus luma* and *M. ugni*, which are famous for their delicious fruits. Besides these Coccidæ, quite a number of European Aphids have also permanently settled, but not a single species of the many Lepidoptera* and Coleoptera, injurious to growing cultivated plants and trees, has ever been introduced with its food-plant. Thus, there are never any caterpillars nor flea-beetles on the Chilian cabbage; there are no wormy apples, pears, plums [prunes ?]; there are no Canker Worms, Cut-worms, no Tent Caterpillars and no Pea Weevils.

Of other injurious Coleoptera very few have found their way to Chili; *Sitodrepa panicea*, the well-known Herbarium pest, *Corynetes violaceus*, the Bone Beetle, and *C. ruficollis*, the Ham Beetle, are economically not very important. Two grain-weevils occur, *Calandra oryzæ* and *C. granaria*, the damage done by the latter being often enormous; but another grain pest, *Tinea granella*, has never been heard of in Chili. In houses, *Tinea biseliella* (*crinella*) is very common, feeding on carpets. Several European Dermestidæ are from time to time brought over in ships, but do not seem to flourish in Chili; their places are occupied by native species, and the Chilian *Eurhopalus variegatus* is fully able to dispose of any insect collection so as to need no assistance from the kindred European *Anthrenus*. *Tenebrio molitor* has in quite recent years been intentionally introduced, the larva being used as birds' food, but has not yet spread further.

As a matter of course, *Blatta germanica* is also not rare, but Dr. Philippi found it only in the woods and is inclined to consider it as autochthonous.

The parasites of man, viz, the flea, the bed-bug, and the three species of lice, are just as common in Chili as elsewhere. The fleas and the lice no doubt accompanied the first human immigrants to Chili, while the bedbug came in all probability only after the arrival of the Spaniards; even to-day it is still absent in the province of Valdivia and in the country of the Araukanians. The flea occurs in Chili as elsewhere only up to an altitude of 5,000 feet. The Jigger, *Sarcopsylla penetrans*, which is a considerable annoyance along the coast of Peru, occurs nowhere in Chili.

* *Plusia gamma* which occurs in Chili is claimed by Dr. Philippi as an endemic species.

The house-fly is, in Chili, the same common and annoying companion of man as elsewhere, and the question whether or not it existed before the arrival of the Europeans will never be answered. *Stomoxys calcitrans* is rather scarce in Chili, and Dr. Philippi observed it first twenty years ago; it is not mentioned in Gay's work.

With the introduction of domestic animals some of their insect parasites have also come to Chili. The sheep-tick (*Melophagus ovinus*) was introduced at a very early period, but the sheep gad-fly (*Œstrus ovis*) exists in Chili only since about twenty-five years. *Œstrus bovis*, occasionally introduced in breeding cattle, has hitherto not taken a firm hold on Chilian soil. *Œstrus equi* and *Hipposboca equina* have never been found in the country nor has Chili any native species of that family. The chicken and pigeon have also added their parasitic Acari (*Acarus gallinæ* and *Argas reflexus*) to the Chilian fauna.

The Red Spider (*Tetranychus telarius*) has become extremely numerous and injurious in Chili, but it is interesting to note that in the southern provinces, *e. g.*, Valdivia, where rains are frequent and abundant, this pest has never been found. Whether the Itch Mite (*Acarus scabiei*), which is especially common on the island of Chiloe, is to be considered as an endemic insect or as an importation by the Spaniards can never be satisfactorily decided.

We mentioned above that *Plusia gamma* and *Blatta germanica* are considered by Dr. Philippi as endemic forms, and to those must be added *Ophion luteus* and *Acridium tesselatum*, which according to Prof. Carlos Berg is different from *A. migratorium*, a question which is, however, still an open one. However that may be, any grasshopper damage in Chili is never done by *A. tesselatum*, but by the much smaller *Œdipoda cinerascens*. But since more than forty years there was never any damage worth mentioning done by grasshoppers, whereas still at the beginning of this century such invasions took place several times in the vicinity of Santiago. But since that time the enormous increase of the cultivated area, in consequence of the construction of numerous irrigation canals, has forever prevented an undue multiplication of the grasshopper.

REMARKABLE ABUNDANCE OF THE CECROPIA SILK-WORM.

Miss Clara E. Brown, of Calaway, Custer County, Nebr., writes to the Commissioner of Agriculture, under date of October 5, sending specimens of the Cecropia cocoon, and stating that the worms commit great havoc among the timber claims of that section, and that the cocoons are to be found in vast numbers this fall fastened to the limbs of the trees. She also found them fastened to a bush which they call the "Shoe-string" (*Amorpha canescens*) in that country. Her object in sending was to see whether they could be made of any commercial value, but, as is well known, the difficulty in reeling the silk prevents this.

THE CLOVER-ROOT BORER.

As has been pointed out by Mr. James Fletcher, this insect has become known of late years in Canada, and we learn from an item in the Rural New Yorker for September 15 that it has been found upon the Rural farm on Long Island. This destructive enemy of the clover plant is a slow spreader, and it is very fortunate that this is the case, as it is a very difficult enemy to fight.

A POINT IN FAVOR OF THE ENGLISH SPARROW.

Mr. J. G. Cooper, writing to the Pacific Rural Press of September 8, 1888, records the destruction of the Woolly Aphis upon his apple trees by a large flock of young English sparrows, but is inclined to think that it was due to the excessive dry weather, causing a scarcity of their usual food.

THE REAR-HORSE DOMESTICATED.

Many of the old office desks in the Department of Agriculture here at Washington have become badly infested with Roaches and Croton Bugs, which feed upon almost everything left in the drawers. One of the assistants in the Entomological Division was paying a visit some days since to a lady employed in one of the other divisions, and to entertain him she showed him what she called her "entomological pet." This was a handsome female specimen of *Mantis carolina* which she had captured and domiciled upon her desk and fed with roaches until it had become reconciled to its position. At the date of the visit the Mantis seemed perfectly at home and the original insect inhabitants of the desk were rapidly becoming less numerous. This practical application of entomological knowledge is highly to be commended and greatly encourages the entomologists of the Department in their labors to diffuse knowledge of the habits of insects!

A CALIFORNIA ENEMY TO WALNUTS.

Mr. Coquillett, writing us under date of April 16, gives an account of a Tortricid larva which does a great deal of damage to Walnuts near Los Angeles. We quote his note as follows. The description of the larva comes first:

Body green, sometimes tinged with yellow; piliferous spots lighter; spiracles ringed with brown or black; cervical shield greenish, irregularly bordered behind with black; head yellowish; a black or brown dot on each side of face, another on lower part of clypeus; a black or brown triangle on each lobe of the head; sides of head broadly and irregularly bordered with black or brown. Body nearly naked, provided with 16 legs. Length 14^{mm}. Lives singly in the green nuts of *Juglans californica*. They usually enter the green nut near the stem end, and make from one to three holes in it, out of which they push their black excrements, which collect in a conspicuous heap at the mouth of each hole. After eating out the interior of one of the nuts the larva deserts it and eats its way into a second nut, and this it continues until reaching its full growth. In the breeding cage the full-grown larvæ de-

serted the nuts and crept beneath the litter in the bottom of the cage, where they spun tough, grayish cocoons. The larvæ were found on the 8th of May, spun their cocoons in June, and the moths issued on the following dates: March 4, 12, 13 (four), 15, 18, 24 (two), 25 (two), 27, and 29 (two).

Fully five-sixths of all of the walnuts growing upon the trees on one of the hills near the city of Los Angeles were or had been infested by one of these larvæ. They enter the nuts when the latter are from a half to three-fourths of an inch in diameter.

The moth is very close to *Proteopteryx emarginana* Wlsm., but is nevertheless distinct, and it may be a new species; but this point we shall decide after receiving a larger series of adults.

LITTLE KNOWN ENEMIES OF THE POTATO PLANT IN NEW YORK.

The occurrence of the Cucumber Flea-beetle, *Crepidodera cucumeris* Harris, in immense numbers in the potato fields of New York the present season has, no doubt, resulted in much damage to the crop. But as the beetles were associated with *Cosmopepla carnifex* Fab. in this work of destruction in western New York, a similar state of affairs may have existed elsewhere, and the damage have been entirely attributed to the beetles. This fact would be of economic importance, as a remedy that might be effective in fighting the one might be worthless in destroying the other.

Singularly enough, the only locality where the species under consideration has previously been reported as injuring the potato was in Livingston County also, it having been sent to Professor Lintner from Souyea about the middle of July, several years ago, and mentioned by him in his second report as State entomologist of New York, p. 144. Professor Lintner also states that the same insect was reported very injurious to the fruit of the Currant about Montreal, Canada, in 1884, where it reappeared the following year in still greater numbers.

On August 9, 1888, Prof. James Troop, of La Fayette, Ind., sent me specimens of *Cosmopepla carnifex* from Livonia, Livingston County, N. Y., with the information that they were swarming on the potato tops, especially among the curled leaves, which they punctured, these leaves afterwards withering up, turning black, and ultimately falling off, evidently to the serious detriment of the crop. When placed in the box in which they were sent to me the insects were nearly all yet in the pupal stage, but on reaching me, on the 12th, only one pupa appeared, the remainder having reached the adult stage, and in one instance the female had oviposited on one of the inclosed leaves.

The bugs were transferred to new quarters and given fresh plants, upon which they subsisted continually till the 24th, when they were killed and preserved.

Prof. Herbert Osborn, of Ames, Iowa, tells me that he has observed these bugs on the foliage of the grape, and very kindly forwarded me specimens of the eggs for comparison with those obtained by myself.

The egg is four-fifths of a millimeter in length and three-fifths of a millimeter in diameter, cupuliform, with a ring of about 16 long, slen-

der, sinuous, white appendages resembling spines, except that the ends are knobbed. These are bent so as to point outward. The whole surface of the egg is covered with minute short spines, these being longer and more thickly placed within the ring. The natural color is dark bronze-brown, but alcoholic specimens are of a dull white color, the minute spines of brown showing distinctly on the surface. The eggs are placed in clusters, the ringed end upward, resembling a cluster of minute cups.—[F. M. Webster.

PROFESSOR FORBES' INVESTIGATION ON THE FOOD OF FRESH-WATER FISHES.

The number of insects which are known to feed on fishes is very limited, and these few could probably subsist on mollusks or other food, and are thus not dependent on a fish diet. On the other hand, a large proportion of fresh-water fishes depend more or less completely on insects as food, and could, therefore, not exist without the insects. To show the importance of insects as one of the principal food-articles of fresh-water fishes has been the object of Prof. S. A. Forbes in a series of admirable papers on the food of fresh-water fishes of Illinois. These papers have been published under various titles in the Bulletin of the Illinois State Laboratory of Natural History (Vols. I and II), between the years 1877 and 1888. The wide scope of these investigations becomes at once apparent from the fact that no less than 1,221 fishes, belonging to 87 species of 63 genera and 25 families, and taken in various months of the year from April to November, were carefully examined, and the food contained in their stomachs determined and classified. In the concluding portion of the series, which has just been published as Article VIII of Volume II of the Bulletin, Professor Forbes presents the summary of his researches and the generalizations derived therefrom. This summary concludes with a classified list of the objects detected in the food of fishes, occupying 28 pages, and the list of insects occupies nearly 13 pages.

This list is of great interest to the entomologist, not only from the species it contains, but also from the many very common species which are absent therefrom, and we regret that on account of its length we can not reproduce it here entire. We quote, however, Professor Forbes' equally interesting general remarks on the food of adult fishes so far as they pertain to the insectivorous species:

"It is from the class of insects that adult fishes derive the most important portion of their food, this class furnishing, for example, 40 per cent. of the food of all the adults which I examined.

"The principal insectivorous fishes are the smaller species, whose size and food structures, when adult, unfit them for the capture of Entomostraca, and yet do not bring them within reach of fishes or Mollusca. Some of these fishes have peculiar habits, which render them especially dependent upon insect life, the little minnow *Phenacobius*, for example.

which, according to my studies, makes nearly all its food from insects (98 per cent.) found under stones in running water. Next are the Pirate Perch, *Aphredoderus* (91 per cent.), and the Darters (87 per cent.), the Croppies (73 per cent.), half-grown Sheepshead (71 per cent.), the Shovel Fish (59 per cent.), the Chub Minnow (56 per cent.), the Black Warrior Sunfish (*Chænobryttus*) and the Brook Silversides (each 54 per cent.), and Rock Bass and the Cyprinoid genus *Notropis* (each 52 per cent.).

"Those which take few insects or none are mostly the Mud-feeders and the Ichthyophagous species, *Amia* (the Dog-fish) being the only exception noted to this general statement. Thus we find insects wholly or nearly absent from the adult dietary of the Burbot, the Pike, the Gar, the Black Bass, the Wall-eyed Pike, and the great river Catfish, and from that of the Hickory Shad[1] and the Mud-eating Minnows (the Shiner, the Fat-head,[2] etc.). It is to be noted, however, that the larger fishes all go through an insectivorous stage, whether their food when adult be almost wholly other fishes, as with the Gar and the Pike, or mollusks, as with the Sheepshead. The Mud-feeders, however, seem not to pass through this stage, but to adopt the limophagous habit as soon as they cease to depend upon Entomostraca.

"Terrestrial insects, dropping into the water accidentally or swept in by rains, are evidently diligently sought and largely depended upon by several species, such as the Pirate Perch, the Brook Minnow, the Top Minnows or Killifishes (Cyprinodonts), the Toothed Herring, and several Cyprinoids (*Semotilus*, *Pimephales*, and *Notropis*).

"Among aquatic insects, minute slender dipterous larvæ, belonging mostly to *Chironomus*, *Corethra*, and allied genera, are of remarkable importance, making, in fact, nearly one-tenth of the food of all the fishes studied. They are most abundant in *Phenacobius* and *Etheostoma*, which genera have become especially adapted to the search for these insect forms in shallow rocky streams. Next I found them most generally in the Pirate Perch, the Brook Silversides, and the Stickleback, in which they averaged 45 per cent. They amounted to about one-third the food of fishes as large and important as the Redhorse and the River Carp, and made nearly one-fourth that of fifty-one Buffalo fishes. They appear further in considerable quantity in the food of a number of the Minnow family (*Notropis*, *Pimephales*, etc.), which habitually frequent the swift water of stony streams, but were curiously deficient in the small collection of Miller's Thumbs (*Cottidæ*), which hunt for food in similar situations. The Sunfishes eat but few of this important group, the average of the family being only 6 per cent.

"Larvæ of aquatic beetles, notwithstanding the abundance of some of the forms, occurred in only insignificant ratios, but were taken by fifty-six specimens, belonging to nineteen of the species, more frequently by the Sunfishes than by any other group. The kinds most

[1] *Dorosoma*. [2] *Pimephales*.

commonly captured were larvæ of Gyrinidæ and Hydrophilidæ; whereas the adult surface beetles themselves (*Gyrinus*, *Dineutes*, etc.), whose zigzag-darting swarms no one can have failed to notice, were not once encountered in my studies.

"The almost equally well known slender Water-skippers (*Hygrotrechus*) seem also completely protected by their habits and activity from capture by fishes, only a single specimen occurring in the food of all my specimens. Indeed the true Water-bugs (Hemiptera) were generally rare, with the exception of the small soft-bodied genus *Corisa*, which was taken by one hundred and ten specimens, belonging to twenty-seven species, most abundantly by the Sunfishes and Top Minnows.

"From the order Neuroptera fishes draw a larger part of their food than from any other single group. In fact, nearly a fifth of the entire amount of food consumed by all the adult fishes examined by me consisted of aquatic larvæ of this order, the greater part of them larvæ of Day Flies (Ephemeridæ), principally of the genus *Hexagenia*.[1] These Neuropterous larvæ were eaten especially by the Miller's Thumb, the Sheepshead, the White and Striped Bass, the common Perch, thirteen species of the Darters, both the Black Bass, seven of the Sunfishes, the Rock Bass and the Croppies, the Pirate Perch, the Brook Silversides, the Sticklebacks, the Mud Minnow, the Top Minnows, the Gizzard Shad, the Toothed Herring, twelve species each of the true Minnow family, and of the Suckers and Buffalo, five Catfishes, the Dogfish, and the Shovel Fish—seventy species out of the eighty seven which I have studied.

"Among the above I found them the most important food of the White Bass, the Toothed Herring, the Shovel Fish (51 per cent.), and the Croppies; while they made a fourth or more of the alimentary contents of the Sheepshead (46 per cent.), the Darters, the Pirate Perch, the common Sunfishes (*Lepomis* and *Chænobryttus*), the Rock Bass, the Little Pickerel, and the common Sucker (36 per cent.).

"Ephemerid larvæ were eaten by two hundred and thirteen specimens of forty-eight species, not counting young. The larvæ of *Hexagenia*, one of the commonest of the 'River Flies,' was by far the most important insect of this group, this alone amounting to about half of all the Neuroptera eaten. They made nearly one-half of the food of the Shovel Fish, more than one-tenth that of the Sunfishes, and the principal food resource of half-grown Sheepshead; but were rarely taken by the Sucker family, and made only 5 per cent. of the food of the Catfish group.

"The various larvæ of the Dragon Flies, on the other hand, were much less frequently encountered. They seemed to be most abundant in the food of the Grass Pickerel (25 per cent.), and next to that in the Croppie, the Pirate Perch, and the common Perch (10 to 13 per cent.).

[1] The winged adults of this and related genera are often called "River Flies" in Illinois.

"Case-worms (*Phryganeidæ*) were somewhat rarely found, rising to 15 per cent. in the Rock Bass, and 12 per cent. in the Minnows of the *Hybopsis* group, but otherwise averaging from 1 to 6 per cent. in less than half of the species."

THE HOSTS OF A FEW LARGER ICHNEUMONIDS.

We had occasion last May, in writing to Mr. Clarence M. Weed concerning his recently-published paper, "Biological Notes on Some North American Ichneumonidæ" (Psyche, Vol. V, No. 145, May, 1888), to bring together the records from our note-books of the habits of several of the species mentioned by him, in order to supplement his short list. As these facts have not been published we give them below as a matter of record:

Pimpla notanda	Proteoteras æsculana.
	A Leaf-roller on Locust (not reared).
Pimpla annulipes......	Carpocapsa pomonella.*
	Phycita nebulo.*
	Papilio ajax.
	Datana ministra.
	Tortrix quercifoliana.
	A Leaf-roller on Strawberry (not reared).
	Teras oxycoccana.
	Heterocampa marthesia.
	Gelechia gallæ-asterella.
Pimpla conquisitor	Aletia xylina.*
	Clisiocampa americana.
	Thyridopteryx ephemeræformis.*
	Phycita nebulo.*
Pimpla inquisitor......	Orgyia leucostigma.*
	Gelechia gallæ-solidaginis.
	Grapholitha olivaceana.
	Coleophora cinerella.
	Leaf-roller on Ash (not reared).
Trogus obsidianator ...	Papilio asterias.
Trogus exesorius......	Papilio ajax.
	Papilio marcellus.
	Papilio asterias.*
	Papilio troilus.*
	Papilio turnus.*
Ichneumon rufiventris .	Pyrameis cardui.*
	Pyrameis huntera.
	Vanessa milberti.

* Those records with an asterisk have been published in our accounts of these species. We may further mention that Professor Comstock in 1879 reared *P. conquisitor* from *Phacellura hyalinitalis*, and that we have more recently reared *P. annulipes* from a *Chilo* near *oryzæellus*, which we have reared from twigs of sumach at Washington.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

November 1, 1888.—Mr. Schwarz read and commented upon a passage in Garzilasso de la Vega's account of DeSoto's expedition, relative to silk-culture in Mexico in the earlier part of the fifteenth century, and offered some remarks on the absence of any reference by that old author to the various insect pests annoying man, with which the Spaniards must have come in contact for the first time during DeSoto's march through North America.

Mr. Fox read some notes on the spiders collected by him in Tennessee during the past summer. He especially commented on the habitat of a species of *Dolomedes* taken by him, and upon the tube of *Lycosa nidifex*, which is different from that described by Dr. Marx in his description of the species. Dr. Marx made some remarks on the paper, and gave the burrowing habits of *Lycosa nidifex* as observed by him near the seashore. He also suggested that this is a good time to collect gossamer spiders, which are now very abundant.

Mr. Howard suggested the collection of spider egg masses for the purpose of trying to get parasites.

Professor Riley suggested that the larva of *Mantispa* can be obtained in the same way. He also made some remarks on the habits of a species of *Agalena* common on his grounds. He further made some remarks on the habits of *Atypus*.

Mr. Smith made some remarks on the habits of *Stomoxys* as observed by him at his residence. He says neither he nor any member of his family have been bitten by them, although they have now entirely replaced the *Musca domestica*. They are not attacked by the fungus which is rapidly killing the few remaining specimens of *M. domestica*.

A discussion of the habits of *Stomoxys* was participated in by Messrs. Mann, Smith, Riley, Schwarz, Howard, and Alwood.

Mr. Schwarz made a series of shorter communications on the following insects, of which specimens were exhibited: On *Dendroctonus simplex* attacking *Larix Americana*, and on the other Scolytids atttacking the Tamarack; on the secondary characters in the male of *Pissodes affinis*; on a new Herbarium pest from California (*Trigonogenius sp.*), on the hitherto unknown female of *Photinus collustrans*; on a specimen of *Sinoxylon basilare* with two-jointed antennal club, and on the occurrence of *Sinoxylon texanum* near Washington. A discussion arose between Messrs. Riley, Howard, Schwarz, and Smith on the constancy of the number of antennal joints in insects and their value in classification.

JOHN B. SMITH,
Recording Secretary.

FIG. 35. *Chalcis flavipes.*

SPECIAL NOTES.

The notices so far published of INSECT LIFE have been very satisfactory indeed, and we feel very much encouraged at the manner in which the bulletin has been received both by entomologists and farmers. The only strictures so far made have been in reference to publication of descriptive matter. We wish to assure our reviewers that while in the main INSECT LIFE will be devoted to the economy of insects, it is also devoted to the promotion of entomology in all its branches. We do not intend to print hurried, isolated descriptions, carelessly thrown together and hastily published to insure priority, but where descriptions form a part of some comprehensive study of any group of insects; where they are based upon a broad knowledge of affinities, or where they are connected with any studies in life history, we shall be glad to give them place. We hope, therefore, to publish some matter of this kind with almost every number of the bulletin.

Recent California Work against the Fluted Scale.—On page 110, No. 4, INSECT LIFE, we published an extract from a letter received during September from Mr. Coquillett, giving a vivid account of the condition of affairs among orange-growers in southern California. One prominent fruit grower has entirely abandoned the industry; another one stated that he would cut down his trees in case he could not make a success of the gas treatment; another took all the money that the oranges and lemons brought him and spent it in spraying his trees with "one of the best caustic washes in use" (!), and as a result his trees were injured to such an extent that they will not bear this year, while the scales are as abundant as ever. Other growers in the San Gabriel Valley state that they were seriously thinking of abandoning their citrus groves. This sad state of affairs is, as we stated eighteen months ago in our Riverside address, by no means necessary. While experiments have shown that the fumigating processes will kill the insects, still they are expensive and elaborate, and our orange-growing friends do not seem to have a proper appreciation of the washes which we have recommended.

It is our firm belief, founded upon personal observation in California, that thorough and persistent work with any one of a half dozen of the kerosene and resin compounds will prove satisfactory. So far as we can learn they have by no means received a fair trial. The experiments made by Mr. Koebele in 1886 and 1887 have demonstrated the efficacy of certain of these washes to our entire satisfaction, and we feel positive that we could keep a young grove comparatively free in the worst infested district at an expenditure which would not be excessive. Where the insect has attained a firm foot-hold in an old grove, it is of course very difficult to eradicate; but young groves can be protected, and in our opinion the horticulturists are making a very great mistake in entirely dropping the washes and devoting so much time to the expensive cyanide-gas treatment. We do not understand, after what has been definitely proved in this direction, how such a vital mistake could have been made as indicated in the case of the man who spent all his money on the caustic washes and seriously injured his trees. Nor can we sympathize so much as we otherwise would with those who have felt themselves obliged to abandon the cultivation of oranges and lemons.

A correspondent in California, wishing to use the fumigation process for destroying orange scales, was informed by the proprietors of an apparatus for confining the fumes that they possessed patents not only upon their mechanical devices but also upon the process of fumigation. Upon receiving word from our correspondent of this state of affairs we took occasion to look the matter up, and came to the conclusions indicated in the following sentences which are extracted from our final reply:

I have had a most careful examination made at the Patent Office here in Washington, with the result that, while I readily find the record of the issuing of a patent to the Culver-Keach people for their apparatus, I can not find the slightest trace of a patent on the "process of fumigation with gas" issued to these people. This claim is probably set up by them for the purpose of keeping other parties out of the field. Moreover, the Patent Office has decided in the case of other parties that the "process" can not be patented, since the so-called Hatch patent covered the same ground, and as this patent has expired the process has become public property. The essential features of the gas treatment were discovered by Mr. Coquillett as an outgrowth of the work he was doing for the Government under my direction, and the results have been made public and are public property. So long as you do not infringe on the mechanical principles used in the fumigator you need, in my judgment, pay little heed to claims for gas treatment.

Introduction of living Parasites: Success of the Mission to Australia.—We had intended publishing in our general notes of this number a quotation from the *South Australian Register* of October 27, giving an account of the apparent success of the mission of Mr. Koebele, one

of our agents, whom we sent to Australia for the purpose of studying and collecting the native parasites of *Icerya purchasi* with a view of introducing them into California; but just as we are going to press the Australian mail arrives, and the following letter from Mr. Koebele covers the ground so much more satisfactorily that we print it in full:

So far my work has been much more successful than I expected. I not only found the dipterous parasite within Icerya in large numbers, but also three predaceous larvæ feeding upon the eggs of Icerya. One of these is a Chrysopa larva, which I first discovered in numbers, it having almost destroyed all the eggs of the infested Icerya at Mannam, 28 miles up the Murray River from Murray Bridge Station, South Australia; the others are larvæ of a small Coccinella. I have collected and sent with this steamer, *Mariposa*, probably 10,000 Iceryæ, of which at least 50 per cent. are infested with the dipterous larvæ and pupæ. Dr. Schomburg, director of the Botanical Gardens of Adelaide, kindly furnished me with a wardian-case, in which I placed three young orange trees and nine of Pittosporum, securely packed down. The Iceryæ were placed in this on sticks of orange placed in earth, so the smaller, half-grown insects can easily crawl up on the fresh plants, and the flies that hatch *en route* may be able to go on breeding. Beside these, I send a large lot in tin and wooden boxes, chiefly taken off of twigs; these latter I have placed in ice-box, so that none will be able to hatch during the voyage. As it looks now, for all are on steamer already, the latter experiment will be the best to follow. Notwithstanding the care and labor I have spent in getting this case here in such condition, I fear that the packages will suffer greatly through the handling of the steamer hands. However it may be, I assure you that success will attend your effort, and I expect to land several thousands of flies in pupa state with every steamer landing at San Francisco.

In regard to the case with plants, this is a bulky thing, weighing 240 pounds, while the same number of scales packed in boxes would make only a few pounds.

The most difficult matter is to get Iceryæ in such large numbers. As yet I have found them only in private gardens, but I know of sufficient for another sending.

On coming on here I also discovered the flies within Iceryæ in Victoria, and am certain that they will be found all over Australia, or wherever Icerya is present.

They are not only parasitic upon Monophlœbus and Icerya, but I am almost certain also upon Dactylopius. I found many empty puparia within dried-up Dactylopius, and also have several fresh ones at Adelaide.

Will remain in New South Wales for about a week or so and make a careful examination of the ground, then proceed to Victoria in search of Icerya, but will be in Adelaide in time to make up a larger shipment.

Economic Entomology in India.—An esteemed correspondent writes us from Calcutta with regard to INSECT LIFE as follows:

I am much interested in your new venture "Insect Life," which is the practical carrying out of a scheme that I have been urging on our people here for years. This is what a practical man wants, the history of an insect and a name or ticket by which it can be recognized by others and by which their observations can be correlated and made use of for all time. In all countries economic entomology must have more attention paid to it than hitherto. Competition and pressure of population both demand every effort of science to reduce the cost of production, and it can be done to a greater extent than has hitherto been thought of. I have encouraged an assistant in our museum to *précis* and distribute your papers. But it is slow work and I should be glad of any papers on the organization of your Department, to found a similar one here. No paid agency can be entertained for other than the scientific work, and

we lack the intelligent unpaid agency which forms the feature of your reports and which gives you what no reasonably paid agency could accomplish. This is my great difficulty: the Indian peasant knows nothing of insects or means to combat them, and is too ignorant and careless to help. There is not one native of India who knows anything of natural history or cares for it or is likely to do so.

Credit to whom Credit is due.—We are sorry to notice from the *Garden and Field* (Adelaide, South Australia) for July, 1888, that Mr. F. S. Crawford, to whom is due the discovery of *Lestophonus iceryæ*, the Dipterous parasite of the Fluted Scale, and who has taken so much trouble to secure specimens to forward them to California and New Zealand, is somewhat hurt by an exhibition of want of knowledge of the facts on the part of a California paper. He quotes from the California journal as follows:

To Professor Coquillett, Mr. Wolfskill, and Mr. Craw great praise is due, for they are in a fair way to do more for Southern California than has been accomplished in many years.

Following this, in his own words, he adds:

All honor, then, be to this patriotic trio, and personally let me express my compliments to the writer of the article, because until I read it I labored under the delusion that I first discovered the Dipteron, that I first suggested its introduction into California and other countries afflicted by the Icerya scourge, and that I have put myself to some little and my friends to much greater trouble in collecting and forwarding the Coccid hosts of these parasite flies—all of which is doubtless a mistake!

We are very sorry that Mr. Crawford feels hurt about this matter, and beg to assure him that it is but a specimen of a certain kind of American journalism for which, in all probability, no one of the three gentlemen in question is in the least responsible. Mr. Crawford's claims upon the gratitude of the California people are well known and abundantly recognized. Our own part in this matter is equally ignored in the article referred to. In our Riverside address, in the spring of 1887, we made use of the following words:

It has doubtless occurred to many of you that it would be very desirable to introduce from Australia such parasites as serve to keep this Fluted Scale in check in its native land. We have a ready seen that there is one minute parasite which has, in all probability, been brought over with it from Australia, and there is no question but that it is very desirable to introduce any such of its enemies and parasites as can be introduced. This State—yes, even Los Angeles County—could well afford to appropriate a couple of thousand dollars for no other purpose than the sending of an expert to Australia to devote some months to the study of these parasites there and to their artificial introduction here.

Receiving through Miss Ormerod the first specimens of Lestophonus, we requested Mr. Crawford to send specimens to Messrs. Coquillett and Klee. We have recently learned that Mr. Klee also independently made the same request to Mr. Crawford after learning that such a parasite existed. The California newspaper man was singularly unfortu-

nate in that none of the three gentlemen whom he mentioned had anything to do with the matter beyond receiving the specimens and attempting to colonize them.

Entomologiske Meddelelser, udgivne af Entomologisk Forening ved Fr. Meinert, Copenhagen.—This is the title of a new journal, of which we have received the first five numbers through the Smithsonian Institution. The name of its editor is a guaranty of the excellence of its contents, a large proportion of which are from his pen. Unlike English journals, this paper contains no prospectus, no price, no indication as to where it is to be obtained, and no date except that of the year. It is printed in good style, on good paper, and in the Danish language exclusively. In the numbers before us there seems evident an intention of giving as complete a list of the Danish insect fauna as possible. The Orthoptera have been completed and the Coleoptera are making good progress. We are glad to greet a new friend.

The *Rural New Yorker* potato contest has been decided and the so-called Rural Seedling No. 2 yielded at the rate of 1,076 bushels to the acre. No. 3 lost the day and was nearly a failure on account of the ravages of the common Flea-beetle (*Crepidodera cucumeris*). Probably the yield of No. 2 would have been greater but for this cause. This insect has been particularly destructive during the past season upon the Rural farm, confining its attack to the leaves and terminal shoots.

It is now proposed to start a potato contest for ladies, the patches to be limited to one-fortieth of an acre or thereabouts. The details, however, are not fixed.

We have received from Prof. Dr. K. Lindeman, of Moscow, a report upon the diseases of tobacco in Bessarabia. The report, unfortunately for American students, is published in Russian and not in the German, in which Professor Lindeman usually writes. He discusses principally the Tenebrionid beetle, *Opatrum intermedium*, a species which is confined to southern Russia, and the larva of which attacks the stem underground. The larva also feeds upon wheat, Atriplex and Convolvulus. He also discusses the injury done by a Thrips (*Thrips tabaci*) and another Tenebrionid—*Pedinus femoralis.*

We have received from George W. Peckham and Elizabeth Peckham a paper entitled "The North American Spiders of the Family Attidæ," which has the appearance of a careful and most conscientious work.

Rev. T. A. Marshall writes us that E. André, of Beaune, is now engaged in compiling a new catalogue of the Hymenoptera of Europe and adjacent countries, every part of which will be submitted to specialists before publication, and which doubtless will for a time prove serviceable to working Hymenopterists.

The Buhach Producing and Manufacturing Company, of Stockton, Cal., very generously offered to sell the Department some time ago seed of *Pyrethrum cinerariæfolium*, at the following rates: One pound, \$50; 5 pounds, \$200; 10 pounds, \$350; 50 pounds, \$1,250; which shows that there is money in the cultivation of this insecticide plant in the United States. We have already shown that the plant can be successfully grown over a large portion of the country and it seems remarkable that this firm should have enjoyed a monopoly so long.

We are anxious to get copies of our First and Sixth Reports on the Insects of Missouri. We shall be pleased to purchase them of any of our readers who happen to have copies that they can spare. We desire these two reports more particularly. The first is published in the Report of the State Board of Agriculture for 1868, and we will purchase copies of that report where the entomological part is not separated. The Sixth Entomological Report was published separately. We are also willing to purchase the entomological reports for any other years.

THE HABITS OF THALESSA AND TREMEX.

By C. V. Riley.

HABITS OF THALESSA.

Our two largest American Ichneumonids (*Thalessa atrata* and *T. lunator*) have long been known to bore the trunks of various trees with their lengthy ovipositors, choosing, apparently, only trees or stumps inhabited by Tremex or other wood-boring larvæ, from which the general supposition has been that the larvæ of the Ichneumonids were parasitic upon the larvæ of the Tremex. Accurate and positive observations on this point, however, seem not to have been made, or at least not to have been recorded, prior to our own, which will presently be quoted.

Harris (Ins. inj. to Veg., p. 538) says of the larva of *Tremex columba*:

It is often destroyed by the maggots of two kinds of ichneumon-flies (*Pimpla atrata* and *lunator* of Fabricius). These flies may frequently be seen thrusting their slender borers, measuring 3 or 4 inches in length, into the trunks of trees inhabited by the grubs of the Tremex, and by other wood-eating insects; and, like the female Tremex, they sometimes become fastened to the trees and die without being able to draw their borers out again.

It will be noticed from the above-quoted passage that while Harris states positively that the larvæ of the parasites destroy the larvæ of the Tremex he says nothing about the place where the parasitic egg is laid and does not even hazard the supposition that the Tremex larva is pierced by the ovipositor of the parasite. Later authors, however, have loosely made this statement without evidence or authority. For instance, Packard (Guide, etc., p. 196) says:

The genus *Rhyssa* contains our largest species and frequents the holes of boring insects in the trunks of trees, inserting its remarkably long ovipositor in the body of the larvæ deeply imbedded in the trunk of the tree.

Following this statement, or possibly some previous one which we have not been able to place, the idea has been current that the wood-boring larva is pierced by the ovipositor of the parasite. As late as 1886 Professor Comstock, in the Standard Natural History, II, p. 514, says:

And the females (*Rhyssa*) are often found with their long ovipositors deeply sunken into the trunks of such trees (infested with Sirex) in the act of laying their eggs in the bodies of the wood-boring larvæ.

From the use of the generic name *Sirex*, Professor Comstock's statement would seem to be drawn from European sources, and this has led us to make some search of European records for observation upon allied species.

Westwood (Introd., etc., II, 150) says:

Some species, whose females are furnished with a very long ovipositor, are found on the trunks of trees, stumps of wood, etc., evidently searching for the lignivorous larvæ, in which they deposit their eggs.

Ratzeburg (Ichneumonen d. Forstins.) states that both Nördlinger and himself reared *Rhyssa persuasoria* from *Sirex spectrum*, and he also records *R. curvipes* as reared from *Xiphidria camelus*. He does not, however give any details of his observations, nor does he state that the parasite in ovipositing pierces the wood-boring grub.

In spite, however, of the lack of definite observations on this point, the idea was almost universally prevalent among entomologists up to recent years that the parasite pierced the grub with her ovipositor and deposited her egg in its body.

In the December, 1882, number of the *Canadian Entomologist*, Mr. Frederick Clarkson gave an account of observations upon this parasite which were, upon the whole, very similar to those which we had previously made. His article was called forth by a popular review of the habits of *atrata* and *lunator* contributed to the May number of the same journal by Mr. W. H. Harrington, in which the latter fell into the old error of stating that the female Thalessa deposits her eggs in the larvæ of the Uroceridæ and other wood-borers by means of her long ovipositor. Mr. Clarkson stated in brief that his experience had demonstrated that while it may be a fact that these insects deposit their eggs upon the

larvæ of Uroceridæ or other borers, they do not commonly do so. In every case that he observed the ovipositor entered through wood that had not been previously attacked, and in his opinion the egg is often, if not generally, laid regardless of contact with the larva. He concluded that if the Ichneumonid larvæ are carnivorous they must bore in search of food, as he thought it improbable that the adults performed the great labor of boring on the chance of meeting with a larva, but rather that they deposit eggs at every insertion.

In 1884 the question was brought up again by Mr. George Gade, of Fordham, N. Y. who had made practically the same observations as Mr. Clarkson, but who drew the strikingly erroneous conclusions that Thalessa is lignivorous and not parasitic. He is reported to have stated at the meeting of the Brooklyn Entomological Society, held September 27, 1884 (see Bulletin Brooklyn Entom. Soc., Vol. VII, Nov., 1884, page 103), that he had long doubted the parasitic habit of the species. He remarked:

I have, during the past season, watched many females ovipositing, and have cut off the ovipositor when ready to be withdrawn, and in no instance have I found a larva of any kind anywhere near the point reached by the borer and where the egg was deposited. The conclusion is, therefore, that the larva is a true wood-feeder, and not parasitic.

In the discussion which followed Messrs. George D. Hulst, and A. C. Weeks are stated to have announced that they had reached the same conclusion from independent observation.

At the December meeting of the Entomological Society of Washington we commented upon this report of Mr. Gade's observations, and later wrote to the editors of the Brooklyn Bulletin a letter which was published in the January (1885) number (page 123), giving the results of our own observation, and quoting the following letter, which we had previously written to Mr. J. A. Lintner, and which he published in an article of his own in the *Country Gentleman* for April 17, 1884 (vol. XLIX, page 331):

I have on several occasions had opportunity of closely studying not only the mode of oviposition, but of larval growth of *Rhyssa*. My sketches and notes are at home [written from Boscawen, N. H.], but the salient facts bearing on your question I can give from memory. In all instances where I have found the female depositing, it has been in trees infested with *Tremex columba*, and I have found her most numerous on badly affected or injured trees, or even on stumps or broken trunks already partly decayed. The instinct to reach the egg or larva of Tremex, so dwelt upon in popular accounts, is imaginary. She bores directly through the outer parts of the tree, and doubtless probes for a burrow; but her egg is consigned anywhere in the burrow; the young larva seeks its prey, and lives and develops without penetrating the body of its victim, but fastened to the exterior. This habit among parasites is much more common than is generally supposed. A great many *Rhyssa* larvæ doubtless perish without finding food, and a great many females die in probing for a burrow, especially when they burrow through wood that is sound and hard.

We also published in *Science*, November 28, 1884 (Vol. IV, No. 95, page 486), a note making the same criticism.

In the discussion which followed the reading of our letter at the November (1884) meeting of the Brooklyn society, as reported by Mr. John B. Smith, Mr. Gade announced himself as "positive that many of the logs frequented by the *Rhyssa* are not infested by Tremex or other wood-boring larva."

It follows from the accurate observations here brought together, and which do not depend upon inference, that Mr. Gade (as all those who support him) was entirely wrong in his conclusion that Thalessa is lignivorous; and though further observations were promised the ensuing year we have looked in vain in the reports of the meetings of the Brooklyn society for any subsequent statement or admission of error.

We have had in our collection since 1872 alcoholic specimens of *T. lunator*, as well as *Tremex columba* in all stages, taken from the trunk of a Box Elder (*Negundo aceroides*) on Mr. William Coleman's farm, near Merrimac, Mo. We took these on the 4th of July, 1872, and made notes as to the habits of the larva and pupa of both species. The tree was already partly dead, and, in fact, our experience in this as in subsequent observations, shows that in most cases the tree has been somewhat affected, so that the wood was not firm and healthy. This stump furnished an excellent opportunity for investigation, because it was so easily split, and we examined the burrows very carefully and found Thalessa in all stages at that time—larvæ, pupæ of both sexes, and imagines of both sexes within the tree, the larvæ being of various sizes and invariably external to the Tremex, *i. e.*, not within, but holding on to its victim and sucking the latter's life away, without in any case entering the body. At this same time females were also actively engaged in ovipositing, and by carefully tracing the ovipositor in several cases we came to the conclusion that she did not attempt to reach the Tremex larva but only to reach its burrow, and that the young parasitic larva after hatching must instinctively seek its victim. Thalessa, therefore, is not an internal parasite and in this it agrees with a great many other parasites both Hymenopterous and Coleopterous, *e. g.*, Ophion, Typhia, Euplectrus, Elachistus, Elasmus, Polysphincta, Acrodactyla, Rhipiphorus, etc., which are all external, as we know from our own experience and Mr. Howard's; while Tryphon, Sphinctus, and Paniscus are mentioned by Westwood as having the same habit. In fact, external parasitism is far more common among the larvæ of the Ichneumonidæ and the Chalcididæ than has hitherto been supposed, and may be said almost to be the rule with all parasites upon true Endophytes, and with secondary parasites. The truth of the whole matter is, that Thalessa, like all other insects, is liable to suffer from fallible instinct, and that while she doubtless has better means of distinguishing a tree infested by Tremex than we have, she nevertheless often makes mistakes, and the "unerring instinct" which book entomologists are so fond of dwelling

upon is often at fault. In our own experience we have never found her boring in uninfested trees, as others have done, and in cases where she fails to reach a Tremex larva and to fasten her egg upon or near it she must either reach a Tremex burrow or a Tremex larva must come in contact with such egg or the larva issuing therefrom to insure perpetuation. The Thalessa larva no doubt actively searches for its victim within the burrow, but, from the nature of its mouth-parts, is incapable of boring wood as Mr. Harrington and Mr. Clarkson suppose.

METHOD OF OVIPOSITION IN THALESSA.

The method of oviposition in a creature with such an enormously long ovipositor as Thalessa possesses must be of particular interest. We have had good opportunities of observing it. In preparing for the act the position is generally longitudinal or in a line with the axis of trunk or branch, the head either up or down. With the abdomen raised in the air the ovipositor is taken and managed with the hind legs, and the tip guided by the front tarsi. The two outer sheaths are used as props and do not enter the wood with the ovipositor proper. They are generally crossed — a position which gives additional strength and security to them. Now, by a movement from side to side, and by arching the abdomen and bearing upon the ovipositor she gradually forces this back through the tip of the abdomen into a membrane which issues

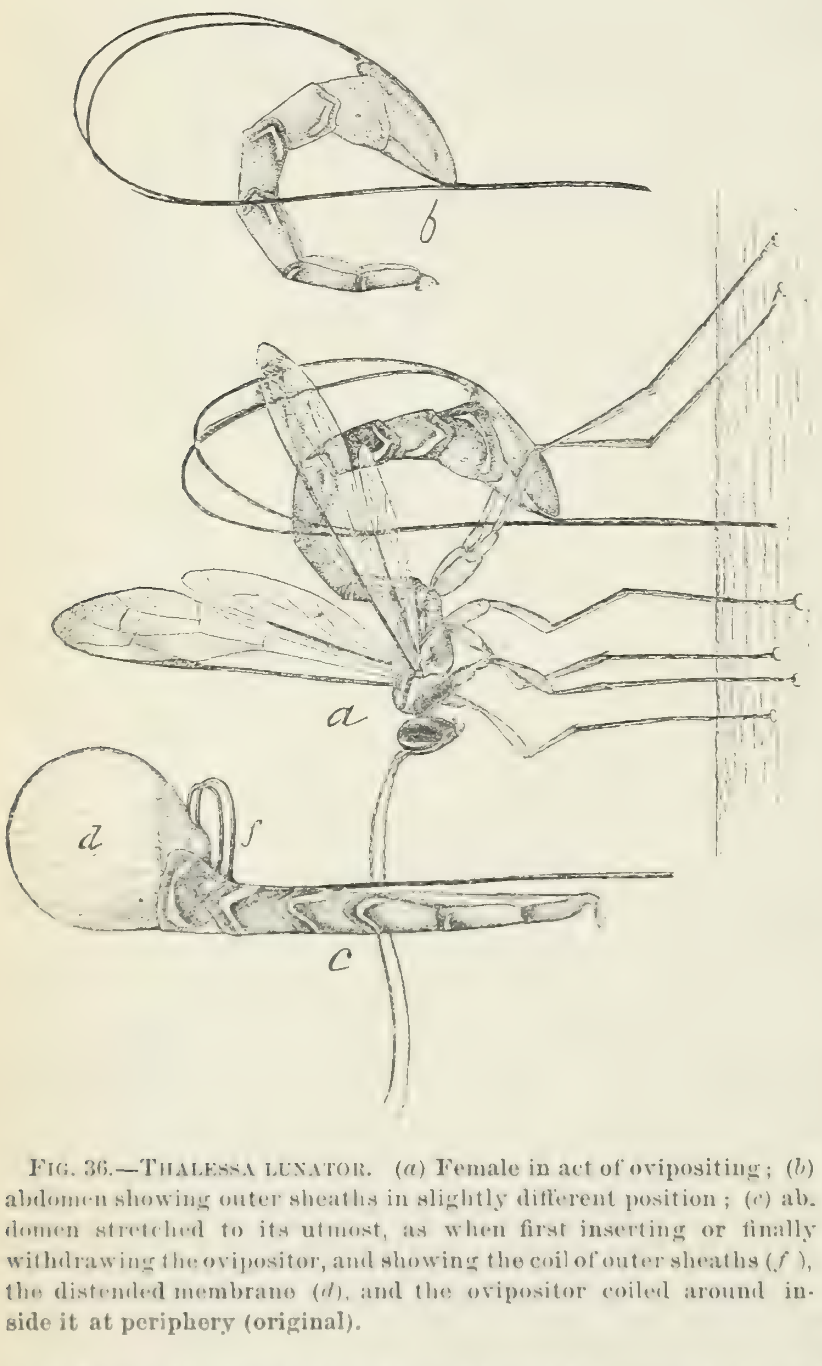


FIG. 36.—THALESSA LUNATOR. (*a*) Female in act of ovipositing; (*b*) abdomen showing outer sheaths in slightly different position; (*c*) abdomen stretched to its utmost, as when first inserting or finally withdrawing the ovipositor, and showing the coil of outer sheaths (*f*), the distended membrane (*d*), and the ovipositor coiled around inside it at periphery (original).

from between the sixth and seventh joints dorsally. There is a wonderful muscular power in the anal joints, and the ovipositor is forced back until it forms a perfect coil, so that when the abdomen is stretched in a straight line to its utmost (Fig. 36, *c*) the ovipositor within the membrane makes a circle almost as large as a quarter of a dollar, the anal joint having made a three-fourths turn within the membrane. In this manner the ovipositor under the venter has been sufficiently shortened to bring its tip against the bark. During this operation, however, the outer sheaths, which have not followed the ovipositor within the membrane, have been obliged to make a more or less irregular coil opposite to and in front of the membrane on the ventral side as at Fig. 36, *f*. Now commences the operation of boring, and with the wonderful muscular power in the anal joint and the elasticity of the membrane, the insertion of the ovipositor goes on quite steadily if the wood be in the least soft. As the borer enters, the sheaths make a larger and larger loop on one side of the body, or even a valve on each side, and at last, when the borer is well nigh inserted, they present the appearance represented in *a* and *b*. Our figures, made from sketches in the field at the time mentioned, will convey a very good idea of this interesting process. In withdrawing the ovipositor the reverse action takes place and the loops of the outer sheaths gradually become smaller and smaller; the ovipositor proper is again forced back into the tough bladder-like membrane between the sixth and seventh joints dorsally and we have a repetition of the appearance (*d*) as already described. The popular figures of the act of oviposition which we have so far seen are for the most part imaginary and erroneous. That of Rhyssa by Blanchard, for instance, is purely imaginary and shows the ovipositor inserted in a Sirex larva, while that by Wood is still poorer. The best we have seen, and evidently copied from some European work, we take from an old *American Agriculturist* (Fig. 37). The species is evidently *Rhyssa persuasoria*, which is common to Europe and North America, and which, having a relatively shorter ovipositor than Thalessa, may not require the elastic membrane. The larva and pupa of

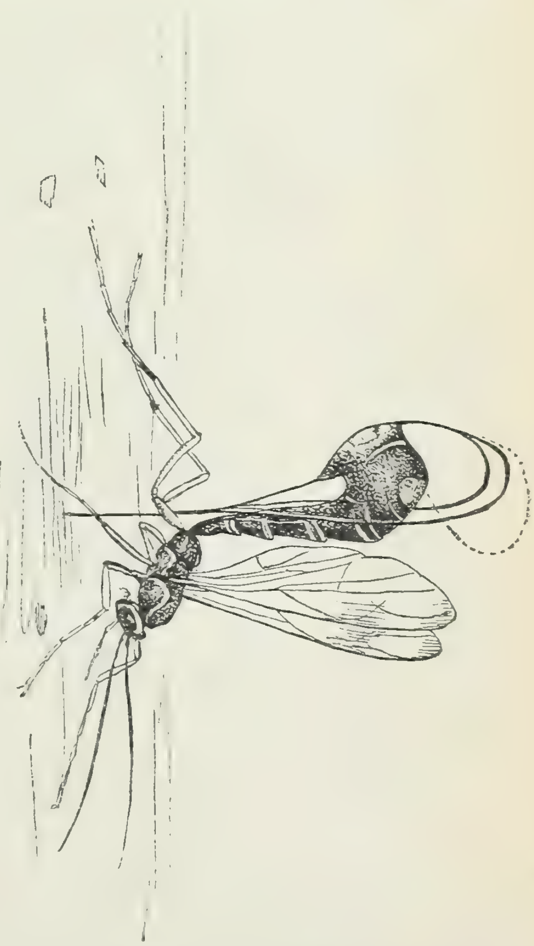


Fig. 37. *Rhyssa persuasoria* ovipositing. (After the *American Agriculturist*).

this species are figured and described by Snellen van Vollenhoven in *Tijdschrift voor Entomologie* (IV, 1860, pages 176, 177, plate 12). The ovipositor of the pupa, as is to be expected, is only about one-half as long as that of Thalessa.

Probably as good an account of the method of the boring as has been published, and one of the earliest accurate accounts, is that contributed by Mr. J. Quay to our *American Entomologist* for September, 1880 (Vol. III, page 219). We quote from this article as follows:

As these insects, by standing on "tip-toe" and elevating their abdomen to its fullest height, can clear but about 2 inches space, the problem presents itself as to how can the remaining 3 inches of ovipositor be disposed of in order to allow the drill end to enter the perforated stump.

I observed that after raising the abdomen as far as possible the drill was worked forward so as to slightly bend under, giving the insect a purchase on same. Then followed a bearing-down motion on the bent tube, curving the end of the abdomen forward and upward, and next forcing the ovipositor, near its attached end, to curve also and pass up through the abdomen and above into a cavity which there opened for its reception.

What a strange provision of nature!

The cavity was inclosed by a membranous sack, capable of great distension, and while the drill was being continually forced up through, it curled about within the sack, forming one complete bend of about three-fourths of an inch in diameter, and another partial one. When fully distended the sack was very thin, quite transparent, and seemingly upon the point of bursting apart. But the ovipositor was in this manner brought to the edge of the worm-hole, was slipped in, and thus made to ease away upon the distended sack, which, by collapsing, forced out again the drill by its mere force of contraction. The coil now soon disappeared, and the insect was fully prepared to commence operations upon the hapless *Tremex*.

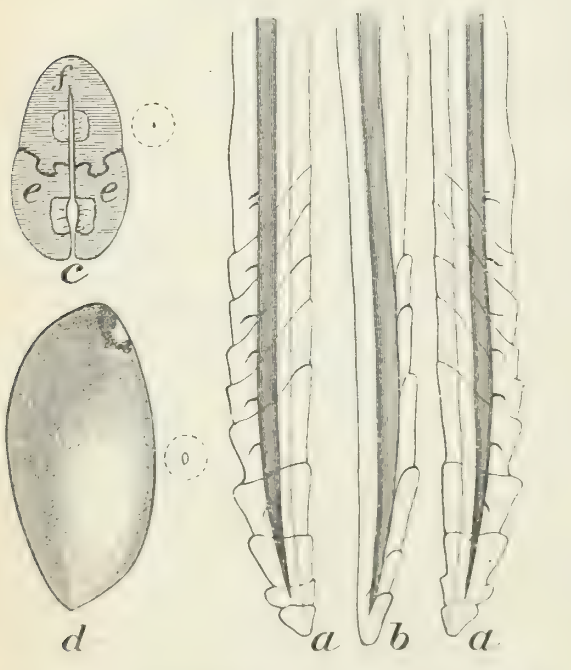


FIG. 38.—Ovipositor and egg of Thalessa; *a, b, a*, tips of component parts of ovipositor proper; *c*, cross-section of ovipositor; *d*, egg; *e, e*, ventral pieces of ovipositor proper; *f*, middle or dorsal piece of ovipositor, all greatly enlarged (original).

STRUCTURE OF THE OVIPOSITOR.

Our readers who have followed us so far will doubtless wonder how an egg can be passed down such a long ovipositor not wider than a horse-hair. A careful examination will show that this instrument is composed of three parts, which may, upon being softened, easily separate, but which in nature are securely locked together. Figure 38 illustrates the ends of these three parts *a, a, b* as they appear when on their flat sides, and it will be noticed that the tips are strongly notched diagonally, which structure facilitates the insertion or boring into the tree and renders extraction somewhat more difficult, especially where the wood is somewhat hard. Now the dorsal or central piece is solid at its

dorsal end and cleft on the inner side to about two-thirds or three-fourths its length. On either side of this cleft is a strong ridge or rail something after the fashion of a T-rail. Each of the ventral pieces, on the contrary, has a groove into which the rail-like ridges of the dorsal piece lock. The ventral pieces in the act of oviposition slide up and down these rails, which serve to keep the three pieces securely fastened together. Through the center of the dorsal piece runs a membranous duct, which is probably muscular, and is formed by a groove on either side of the cleft, while through the connected piece that the other or ventral pieces make when conjoined runs another similar duct. The margins of the membrane in either duct when seen by cross section look somewhat like a septum. Figure 38, *c*, shows a cross section of the three pieces when interlocked, taken about the middle of the ovipositor, the appearance varying somewhat in different parts of the instrument. The egg (Fig. 33, *d*) is 0.18^{mm} long and 0.13^{mm} in greatest width; it is ovoid in form, and compressed at the sides, and is evidently worked down by the muscular linings of these grooves. The pieces as a whole are, when interlocked, doubtless bulged out to admit of the passage of this egg. The greatest expansion must take place about the middle of the cleft by virtue of the fact that while the combined ovipositor is oval in transverse section the burrow or perforation is more cylindrical, thus permitting the bulging of the cleft at its middle and preventing too great separation of the open end formed by the ventral pieces.

We are much indebted to Mr. Gade for specimens of the egg, as also for preserved females showing the distended membrane. The dimensions of the egg which we have given are from eggs examined by dissection in the female abdomen, and correspond to the size of the ovipositor; but the eggs from Mr. Gade, and from which our figure was made, are larger and more elongate.

The manner in which the females, especially after they have been enfeebled, become fast in the trunks which they bore has often been re corded as a matter of observation. On November 9, 1872, at Glencoe, Mo., we found the nearly mature female Thalessa in another Box Elder tree, already mature, but dormant, but evidently ready to issue early the following summer, because she had eaten right to the surface of the bark. The Tremex larvæ were at this time of all sizes, and a careful examination of this tree showed the vicissitudes to which these insects are subject, not only after, but before exit; for females of both genera were often found dead in the tree. The Thalessa matures within its burrow with the wings perfect, and as it depends very largely on the use of its matured jaws for escape, it frequently fails to escape when encountering gnarled and knotty wood.

The Tremex, both in the larva and pupa states, is quite subject to the attacks of a fungus, which so closely resembles the dying and decaying parts of the wood that the infected parts of the skin seemed filled with dead wood.

ARDOR OF THE MALES.

The ardor of the males of Thalessa has often been commented upon. Mr. W. H. Harrington, in the *Canadian Entomologist* for November, 1887 (Vol. XIX, p. 206), recounts, under the head "The Nuptials of Thalessa," a series of interesting observations made in June, 1887, and which showed that the males, having issued first, awaited the females, and were able to locate the spot at which a given female would emerge some time before she made her appearance. In one instance which he records, a particular spot was crowded with males for two days before the female emerged, and even then she was assisted by the removal of the bark by the observer. The males, in waiting, make every effort to reach the female, inserting the tips of their abdomen into crevices in the bark. On emerging the female is instantly seized, the legs of the male clasping the yet unused wings and abdomen, thus preventing her from flying.

DOES THE FEMALE OVIPOSIT IN EXPOSED LEPIDOPTEROUS LARVÆ?

In a communication to the *Country Gentleman* of July 12, 1883, page 561, Prof. J. A. Lintner raised the question as to whether this insect was really constructed for preying as a parasite upon internal borers or whether it did not prey upon exposed larvæ. He wrote as follows:

> The question is therefore raised, Are the commonly accepted habits of the "long-stings" correctly given? Has any one actually seen them in the act of probing the burrows of a *Tremex?* Such an operation has never come under my observation, while probably all field entomologists have repeatedly found them fastened by their ovipositor firmly inserted in apparently solid wood. I recall an instance observed by me several years ago, when what I think must have been *Rhyssa lunator*, was earnestly engaged in placing its eggs in a colony of a species of *Datana*, feeding upon a branch of hickory, in the following singular manner: Its ovipositor was bent beneath it, extending between its legs, with its tip projecting in front of its head, enabling it with perfect ease to select one caterpillar after another for the reception of its eggs. Why would not this be a much better method of using the long ovipositor than the one generally ascribed to it? There would certainly be no hap-hazard work in such oviposition, or any waste of material. In the instance above recorded each thrust told, as was seen in the well-known alarm-jerk of these larvæ, at once communicated from the victim to the entire group. Unfortunately the importance of the observation was not known to me at the time, and no further attention was given to it.

Quite recently, desiring to learn whether Professor Lintner had obtained any further evidence to justify so singular a statement, we addressed him and he informed us that he had no further experience other than that given in his forthcoming report, of which he kindly sent us advance proofs, and in which he quotes a similar observation narrated by Mr. J. S. Woodward, secretary of the New York State Agricultural Society, after repeating his own experience as we have quoted it. The trouble is that in both Mr. Lintner's and Mr. Woodward's observations memory is the sole guide and there has been no positive identification of the species, and, though we have a high regard for the observational powers of both these gentlemen, it seems to us that both must be in error, because a study of the structure of the ovipositor in Thalessa shows clearly

that it is not adapted for stinging soft-bodied larvæ. The very curious structural peculiarities of the abdomen, which we have just described, and which are essential to permit the tip of the ovipositor to be projected against the trunk of the tree are also inconsistent with the motions described by Professor Lintner. So, also, the labored force necessary to bring the ovipositor in position, and in the general act of oviposition in Thalessa, does not agree with what is there described. While the relative length of ovipositor to body varies somewhat, the former generally extends about five inches from the tip of the latter, and if brought under the body would extend over three inches beyond the head. Moreover there is no sharp lance at tip, nor means of curving this last so as to bring it on the back of a caterpillar with the Ichneumon in the position described by Lintner.

The ovipositor of Thalessa is, in short, an elaborate boring and sawing instrument. The simplest explanation of both Lintner's and Woodward's observations would be that, if the insect was Thalessa, she was by chance boring a branch or trunk infested with Tremex at a place where Datana larvæ were massing, as they are known to congregate for moulting purposes in masses upon the trunk. But, as will be seen, Professor Lintner's statement is too explicit as to the alarm-jerk of the stung Datana larvæ to justify this first explanation of the riddle, and the attitude assumed by Thalessa would not correspond to his description; so that upon careful consideration we are satisfied that the true explanation is that some other large Ichneumonid was observed by both and by both mistaken for Thalessa. Some of the large Ophionids of the genera Thyreodon, Exochilum, or Heteropelma might be quite easily mistaken therefor, especially at some little distance.

Both Exochilum and Heteropelma are parasitic upon Bombycid larvæ, which feed externally like Datana, and in our breeding experience we have found the commonest parasite of *Datana ministra* and *Datana integerrima* to be a large undescribed Heteropelma that might easily be confounded with *Thalessa lunator*, unless one is quite careful in observation. It is true that the ovipositor in these genera can not be extended to any great length, probably not more than half an inch; but the abdomen in oviposition is undoubtedly curved under the body in such way that the caterpillars are stung in front of the parasite very much as described by Mr. Lintner. The abdomen is long enough to allow this, and it is the customary position with Ophionids when ovipositing. Another, black, species (*H. flavicornis*) resembles, in a similar way, *Thalessa atrata*.

The particular species of Heteropelma which we have bred from Datana larva is undescribed, and at Mr. Cresson's request we add a description of it in this connection:

Heteropelma datanæ sp. nov.

Female.—Average length 25^{mm}; expanse 35^{mm}. General color ferruginous-brown, the abdomen verging to bronzy-black. *Head:* Antennæ uniform yellowish-brown, a

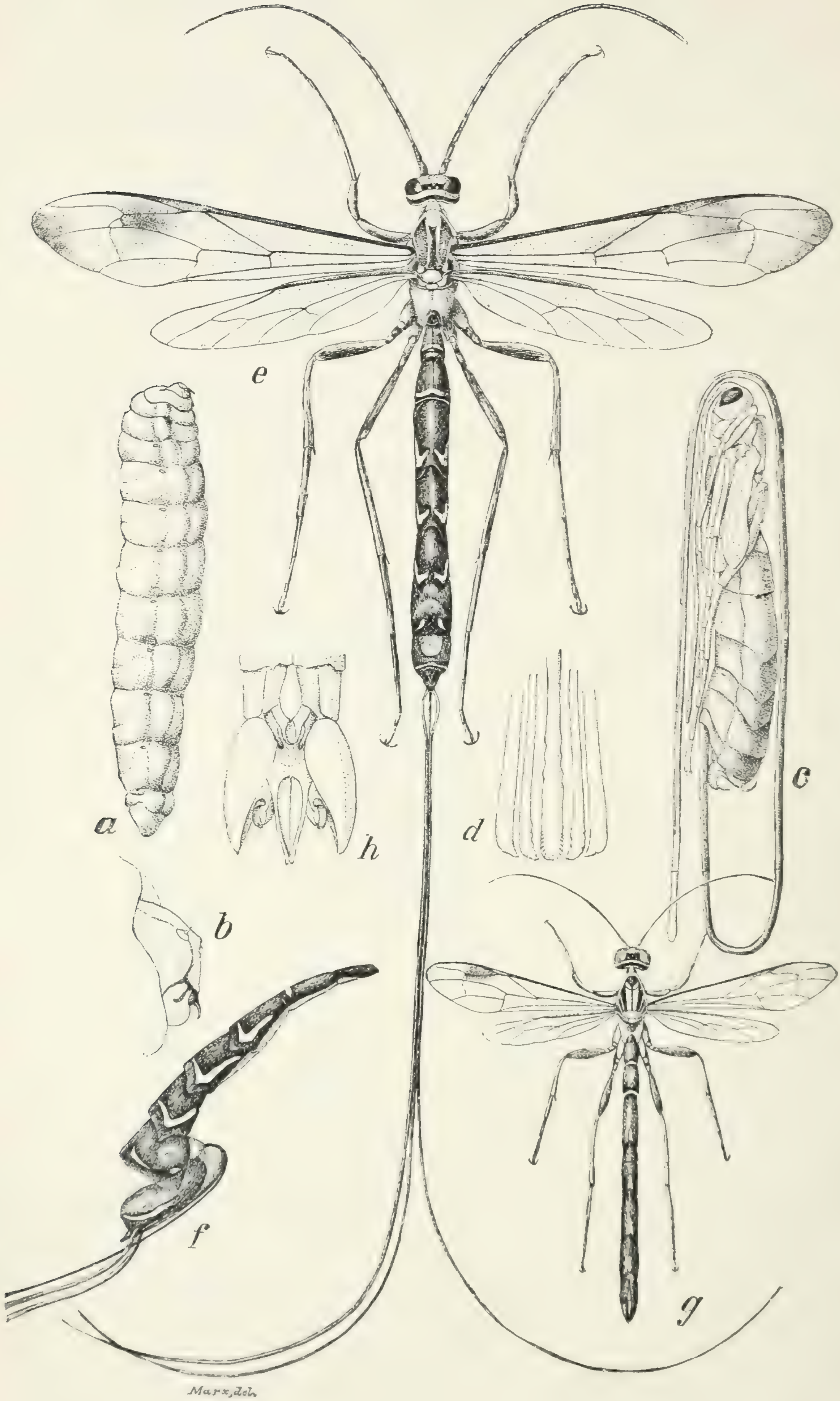
little darker than head and thorax, the scape yellowish below; face below antennæ, and a narrow band around eyes (sometimes obsolete above) gamboge yellow; eyes black or dark brown. *Thorax* darker above than below; mesoscutum with three broad indistinct darker longitudinal bands, which vary considerably in intensity, rather sparsely punctate, slightly shining, with a very faint median longitudinal sulcus: mesoscutellum usually rather lighter in color than scutum, more densely punctate, opaque; metanotum varying considerably in intensity of color, very rugose, the irregular carinæ which produce the rugosity much darker than the intervening spaces, a very shallow median longitudinal groove; legs, especially tibiæ and tarsi, lighter in color than thorax; front trochanters sometimes quite yellow; first joint of hind tarsi fully five times as long as second joint; wings uniformly dark fuliginous, with a bronze reflection; tegulæ concolorous with rest of mesoscutum. *Abdomen* with petiole, concolorous with thorax; joint 2 with a black stripe above, reddish-brow below; joints 3 to 7 dusky, nearly black, with a bronzy or purplish sheen; lighter on ventral line; outer sheaths of ovipositor lanceolate, black except at immediate base and strongly pilose.

Eight ♀ specimens from pupæ of *Datana integerrima*.

Differs at a glance from the only other North American species of the genus, viz: *H. flavicornis* Brullé and *H. longipes* Provancher.

FIG. 39.—TREMEX COLUMBA. *a*, larva, showing Thalessa larva attached to its side; *b*, head of larva, front view, enlarged; *c*, female pupa, ventral view; *d*, male pupa, ventral view; *e*, adult female—all slightly enlarged (original).

In reference to the transformations of Thalessa our figures will sufficiently illustrate them so that there is not much need of a further remark. The larva (Plate I, *a*), as will be seen, has the ordinary Ichneumonid form, tapering at both ends, and has the typical parasitic jaws (*b*) quite incapable of gnawing through wood. The spiracles are normally arranged. The most interesting feature of the adolescent stages is the pupa in which the long ovipositor extends at first in a direct line from the point of in-



THALESSA LUNATOR.

sertion and then bends in a loop and is brought back over the dorsum and around the head and then back again on the ventral side, hugging the legs, its tip reaching far beyond the tip of the abdomen. In this it differs from the European *Rhyssa persuasoria*, in which the ovipositor of the pupa, according to Snellen's figures, previously mentioned, reaches only some two-thirds the length of the body behind the back.

It remains only to state in reference to the habits and transformations of Tremex (see Fig. 39) that, from the facts already mentioned, it would seem that the imagines mature, as a rule, somewhat later than Thalessa, and that the larvæ are found of various sizes on the approach of winter. We have also found, on one occasion, at Emporia, Kans., on December 16, 1874, in *Celtis occidentalis*, a Tremex imago somewhat torpid and eaten half-way out of the trunk. There are no positive records in this country to show the length of duration of the larva state in either of these genera, but we should expect the Thalessa larva to develop most rapidly when once it finds its food, but to possess also great power of enduring without food in early life. There is doubtless much irregularity in development in both genera, especially after the pupa state is assumed, while the period of oviposition, as we know, may cover several of the summer months.

The larva (Fig. 39, *a*) has the normal form of the horn-tails, being blunter at both ends than the Thalessa, with an anal thorn, short thoracic legs and strong gnawing jaws (Fig. 39, *b*). Our figure (*a*) shows a young Thalessa larva attached about the middle, just as it has remained since 1872 in our alcoholic specimens. The ovipositor in the female pupa, as shown in the figure (*c*) is not bent.

We have the authority of Kollar that the larva of *Sirex gigas* attains full growth in seven weeks after the laying of the egg, and that in the pupa state it may remain in the tree for several years. Normally both Thalessa and Tremex probably go through their transformations within a year. *Tremex columba* is at times abundant enough to materially injure trees, and Mr. Jonathan Periam, the present editor of the *Prairie Farmer*, sent us an account (November 28, 1873) of a hickory tree which he believed was killed by it. Our figures will convey a very good idea of the adolescent states of both. They were drawn by Dr. Marx, with our assistance, from our Missouri material, and also from a pupa kindly loaned for the purpose by Dr. H. A. Hagen, our own examples of the pupa being too mature to permit of a good figure being made.

EXPLANATION TO PLATE I.

Thalessa lunator: a, larva, side view; *b*, head of larva from side; *c*, pupa, side view; *d*, tip of ovipositor of pupa, ventral view greatly enlarged to show five parts (including sheaths) of which it consists; *e*, adult female; *f*, abdomen of adult female from side, showing gap between joints 6 and 7, from which the membrane distends when ovipositor is in action; *g*, adult male; *h*, anal extremity of abdomen of male enlarged. (Original.)

NOTES ON LACHNOSTERNA FUSCA, Auct.

By John B. Smith.

Among the injurious insects most commonly referred to in economic papers and reports the above species stands in the first rank. It is known universally as the parent of the "white-grub," and a very general impression prevails that there is but one grub of that kind. As a matter of fact, there are quite a number of species which are almost equally as common, locally or seasonally, as the *L. fusca*, and the injury done by them has, according to the usual rule, been saddled on the universal scapegoat, which in this genus has been *fusca*. Until very lately entomologists have been entirely at sea as to the specific limitations of our species. It was an understood matter that they were very variable and afforded no safe characters for differentiation. In November, 1887, in Trans. Amer. Entom. Soc., XIV, 209–296, was begun a paper by Dr G. H. Horn, issued early in the present year, which at last brought order out of confusion, and enabled us to arrange our material with some degree of satisfaction.

Among the species recognized, *fusca* is the one credited by Dr. Horn with the greatest amount of variation, and several races are indicated, which are yet said to present no distinctive characters. At the same time Dr. Horn does not seem to be quite sure that there is after all but one species, even though the characters separating them are not obvious. The collections of the National Museum are very rich in specimens and species in this genus, and large collections made this spring, and obtained from various parts of the country, have enabled me to somewhat supplement Dr. Horn's work on the genus. Attention once drawn to a very strongly marked character of the genital structure of both sexes, investigation was continued along this line with the most gratifying results, since the characters afforded are constant, strongly marked, and readily verified. At the present time, only the diversities observed in the species known as *fusca* will be described, further notes made on the large majority of our other species being reserved for publication when more complete.

Studied in the light of the genital structure, *fusca* resolves itself into four distinct species, each almost equally common at special localities, but not at the same.

The characters in which all these forms agree are as follows: Body not pubescent above, shining; antennæ 10-jointed, the club of male always longer than that of the female; clypeus not densely punctured, the margin moderately reflexed, feebly emarginate; lateral margin of thorax not serrate, nor distinctly angulate; the posterior tibiæ are truncate at apex, without a trace of sinuation at the base of the fixed spur of the male; this spur is of moderate size; claws strongly toothed at

middle; the size is large, facies robust; punctuation not coarse; the males with a more or less curved ventral ridge on the penultimate abdominal segment, and without a cupuliform depression on the last segment.

With these positive characters, there is an infinite variation in size, shade of color, form, punctuation, and vestiture. Several species heretofore created on these characters have been properly united by Dr. Horn, for all of them are evanescent, and not to be relied upon for the distinction of species; a positive character, however, is found in the form of the ventral ridge of the penultimate abdominal segment; based on this character, the species into which I would divide *fusca* are recognizable as follows:

Ridge straight; posteriorly not overhanging, but nearly as gradual as the anterior declivity .... *grandis*
Ridge longer, slightly curved, the ends overhanging posteriorly; centrally the ridge is declivous but not overhanging behind .... *fusca*
Ridge shorter, decidedly arcuate, overhanging posteriorly for its full length, the ends at some distance from the posterior margin of the penultimate segment .... *dubia*
Ridge still shorter, still more arcuate, still more overhanging, the ends at the extreme margin of the penultimate segment, and somewhat overhanging the terminal segment .... *arcuata*

By this table the males may be distinguished without much trouble. The females are not so easily separated, yet may in most cases be associated with the males.

L. GRANDIS sp. nov.

This species is, as a whole, rather larger than either of the others, and rather more robust. The sides of the thorax are very perceptibly subangulate before the middle, giving the species a distinctive appearance easily recognized in both sexes.

In the female, the last segment is emarginate, and the middle of the abdomen, especially toward base, is distinctly and somewhat aciculate punctate. The male character has been sufficiently given in the table. The last segment is granulate-punctate.

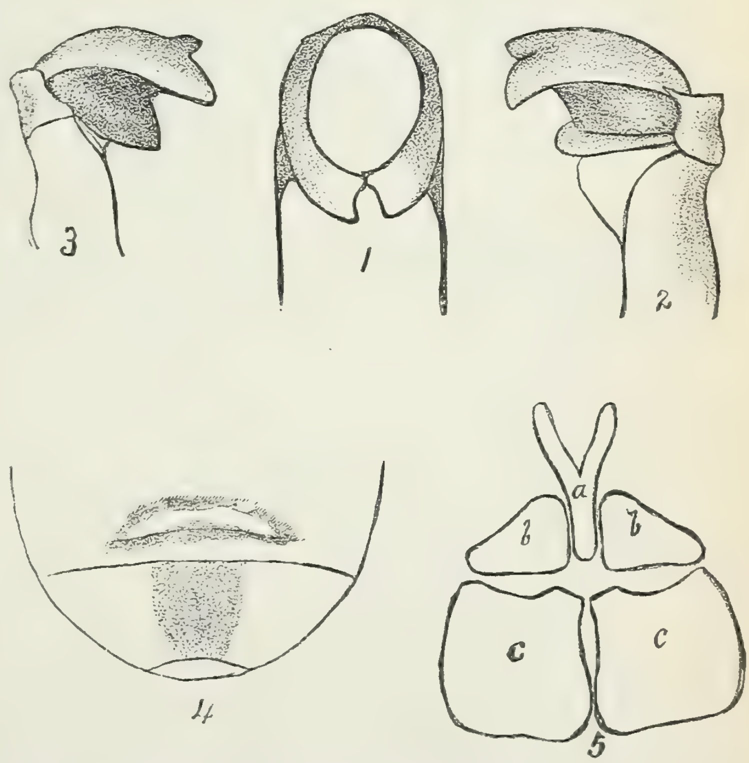


FIG. 40. LACHNOSTERNA GRANDIS: 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

Within my experience this is the rarest of the *fusca* forms, though widely distributed. I have seen it from Texas, North Carolina, Georgia, District of Columbia, Illinois, Colorado, Maryland, New York, Wisconsin, Nova Scotia, Lake Superior Region. Mr. Schwarz thinks it more common in the latter region than the other species. In the District of Columbia it is rare, only a few specimens being known in collections.

I shall not attempt a verbal description of the sexual characters of the male, since the figures will give a better idea than could be otherwise given. In the female this species is peculiar by the slenderly furcate pubic process, and the triangular upper plates, which are completely separated by the pubic process. The lower plates are quadrate or nearly so.

L. FUSCA Fröhl.

This is the form which Dr. Horn in his paper suggests as the form probably seen by Frölich, and upon which he based his species. It offers no points of superficial difference from the following species, with which it agrees in form, color, size, and general habitus. The ventral character in the male must be examined to recognize that sex, and no difficulty will be found in this. The female of this species, on the contrary, differs from all the other forms in that the last segment is not emarginate. This character is at once obvious on examination, and the species is thus readily recognizable in both sexes.

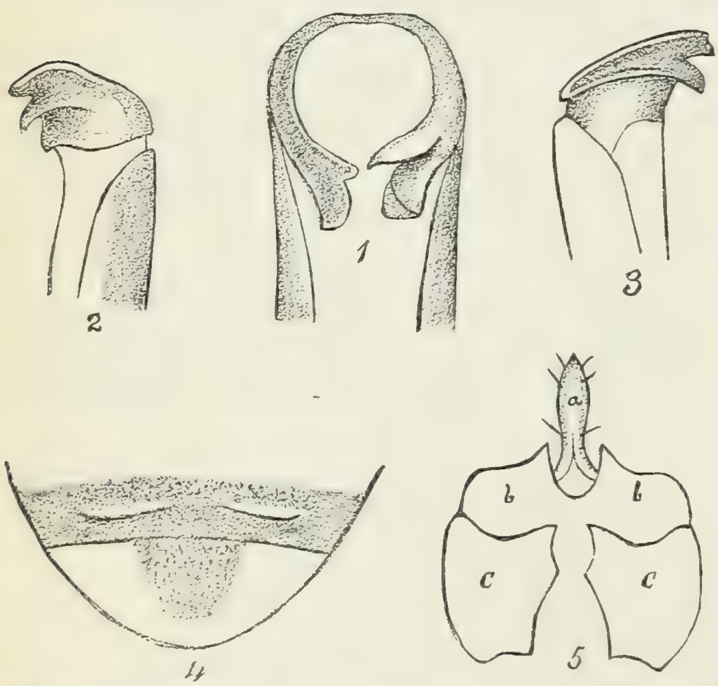


Fig. 41.—Lachnosterna fusca. 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

A comparison of the figures of the male characters with those of *grandis* will at once show how they differ, while still after the same general type. The female shows a greater difference, and differs also from all the others of this group by having the pubic process a simple cylindrical rod somewhat dilated medially and terminating in an obtuse point. The upper plates are coalescent on the median line, and are somewhat irregular.

This species we have from Texas, New York, New Jersey, Ohio, Illinois, District of Columbia, Iowa.

It is the common form around New York City, was the only form found in a large lot of material from Cleveland, Ohio, and was repre-

sented in great proportion in a lot of specimens from the vicinity of Chicago, Ill. In the District of Columbia it is rare, but a single specimen having been found the present season.

L. DUBIA sp. nov.

Completely resembles the preceding in all outward appearance and habitus. The ventral characters of the male must be resorted to for the identification of that sex. As appears from the figure the ridge is decidedly more curved than in the preceding species, and is in every respect more distinctly marked. The primary characters will show on comparison with the previous figures a considerable change in type, which indicates apparently a greater divergence between this and *fusca* than there is between *fusca* and *grandis*. In the female the last ventral segment is emarginate, and it is therefore easily distinguished from that of *fusca*. In the corneous characters of the genitalia the differences noted in the male are emphasized. The pubic process here becomes broad, stout, somewhat contracted medially, and divided superiorly into two branches which are broad, somewhat flattened, and obliquely truncate. The superior plates are narrow, linear.

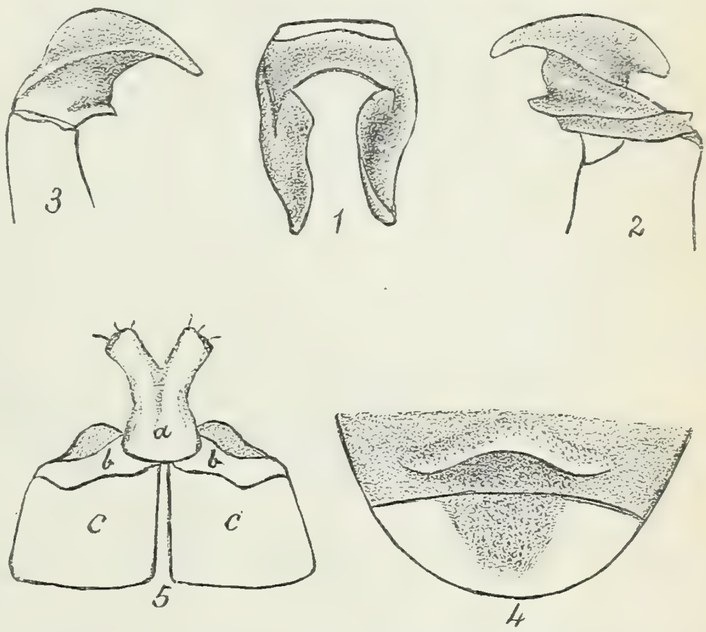


FIG. 42.—LACHNOSTERNA DUBIA. 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

Altogether, it is a distinct species, showing quite a distinct difference in type in the genital structure of both sexes.

This species we have from Massachusetts, New York, New Jersey, Maine, North Carolina, District of Columbia, Illinois, Ohio, Texas, Colorado, Tennessee, Nevada, Montana, California, Wisconsin. Of all the others this extends farthest west, and the race *cephalica* Lec. belongs to this species. It is fairly numerous at New York; forms a fair proportion of the specimens received from Chicago, Ill., but is rare at Washington, no specimens having been collected this season, and only a few specimens in the local collections indicating its occurrence.

L. ARCUATA sp. nov.

This species is as a whole rather smaller than either of the others, although it has probably as great an average length. From *dubia*

it does not differ at all in the female in superficial characters, every effort having failed to discover any feature whereby specimens of this sex might be distinguished from each other. As the genital structure is so distinct this is rather surprising, and the distinguishing feature will no doubt be still discovered.

The primary characters of the female genitalia are of the same type shown in *dubia*, but the distinction is yet obvious. The pubic process, while divided at tip much as in the preceding species, is only about half as long, and does not divide the upper plates as in the preceding species. It resembles the upper part of the *dubia* structure set upon the superior plates; these latter are large and nearly quadrate, in marked contrast with the narrow, linear structures of *dubia*. The inferior plates differ as markedly, as can be readily seen by a comparison of the figures.

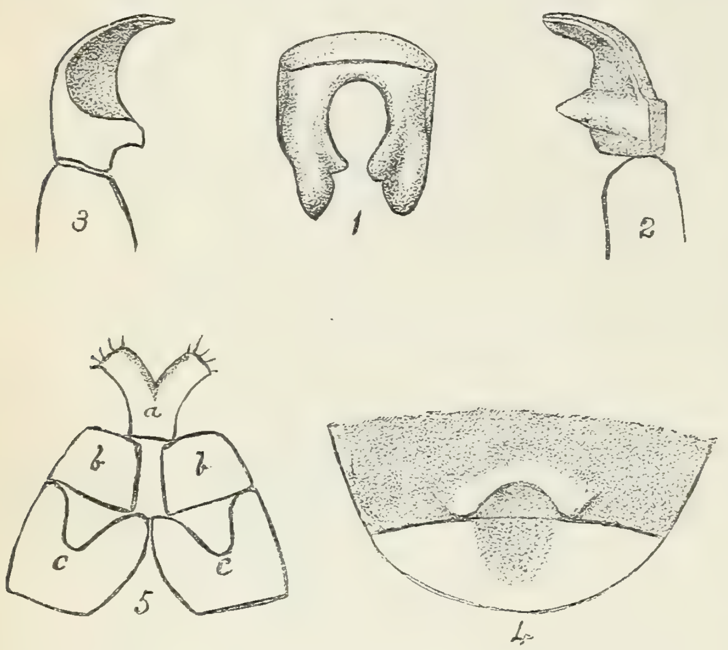


FIG. 43.—LACHNOSTERNA ARCUATA. 1, clasper of male from front and above; 2, clasper of male (right) from side; 3, clasper of male (left) from side; 4, ventral characters of male; 5, genital structure of female; 5*a*, pubic process; 5*b*, superior plates; 5*c*, inferior plates—enlarged (original).

The males also offer no habital or other differences from *dubia*, except in the ventral characters, but these are obvious and easily recognized. The ridge in this species is very much curved, very much overhanging, the ends reaching the apical margin of the segment, while the arch, combined with the depression of the last segment, forms a perfect oval. In this species the space included by the arch of the ridge is smooth; in *dubia* it is punctured.

This species seems rather more southern than the preceding. It is practically the only form taken at Washington, many thousands being taken while only one specimen of the other forms was discovered. Other localities are New York, New Jersey, Central Missouri, Iowa, Georgia. The specimens from New York and New Jersey are from my collection, and form the small minority of the specimens taken. The specimens from Central Missouri are from Professor Riley's collection, and the figures in the Missouri Reports, so extensively copied, probably represent this species.

Finally, these forms represent a series of species, evidently derived from the same stock, and which have differentiated in physiological rather than superficial or habital characters. They have become dif-

ferentiated in both sexes, but have retained those superficial appearances which we may suppose were of value to the ancestor of all these forms.

The study of these characters in all our available species will be continued, and we may hope that a permanent result, so far as the present limitation of species is concerned, can be thus arrived at.

I have taken the course of proposing new names for three of the forms here described, although several names exist in the synonomy which might possibly be available. I have done this because, after discussing the matter with Dr. Horn, he assures me that it would be almost impossible to discover which of the forms, as separated by me, the authors had before them. An examination of the types will have to be made, and as the characters relied upon were in almost every instance color, punctuation, size, or some other equally variable character, it is more than probable that each of the authors have mixed up two or more species under the same name. At any rate, even if the names proposed by me should eventually be referred as synonyms, they will at least have served their purpose of making specific identification certain.

A SANDWICH ISLAND SUGAR-CANE BORER.

(*Sphenophorus obscurus* Boisd.)

In August last we received from Mr. E. J. Wickson, of Berkeley, Cal., a piece of sugar-cane, brought from the Sandwich Islands, infested by borers, which were reported to do considerable damage. The specimens were sent to Professor Wickson by Prof. LeRoy D. Brown, president of the State University of Nevada, who collected them in June while visiting the Sandwich Islands. Professor Brown's attention was called to the subject by his Majesty, King Kalakaua, who requested him to bring the specimens to this country for study. The cane received at the Department proved to be infested by the larvæ of a large Snout-beetle of the genus Sphenophorus, several species of which are known to bore into the stalks and roots of corn in this country. Our Annual Report for 1881–2, page 138 *ff*, contains an account of the habits and transformations of the species which more particularly affect corn in the United States, and which are known as Corn Bill-bugs.

The only previous notice of Sugar-cane Borers in the Hawaiian Islands with which we are familiar is from the *Hawaiian Planter's Monthly* for July, 1883, but this refers to the Lepidopterous borer *Chilo saccharalis*, a species which is widely distributed wherever Sugar-cane is grown. Another species of Sphenophorus affects Sugar-cane in the West Indies and South America and was described by the Rev. Lansdown Guilding in his prize essay on "Insects Affecting Sugar-cane" (Trans. Soc. of Arts, Vol. XLVI, 1828) as *S. sacchari*, while the well-known *Rhyncho-*

phorus palmarum is also mentioned as injuring the cane in the same locality.

We succeeded later in rearing the adult beetle, but failing, with the literature at our command, to recognize it among the vast number of described species, we sent a specimen to Dr. David Sharp, of England, who kindly gave us the following references quoted from the "Memoirs on the Coleoptera of the Hawaiian Islands," by T. Blackburn and D. Sharp,* a work which we could not consult:

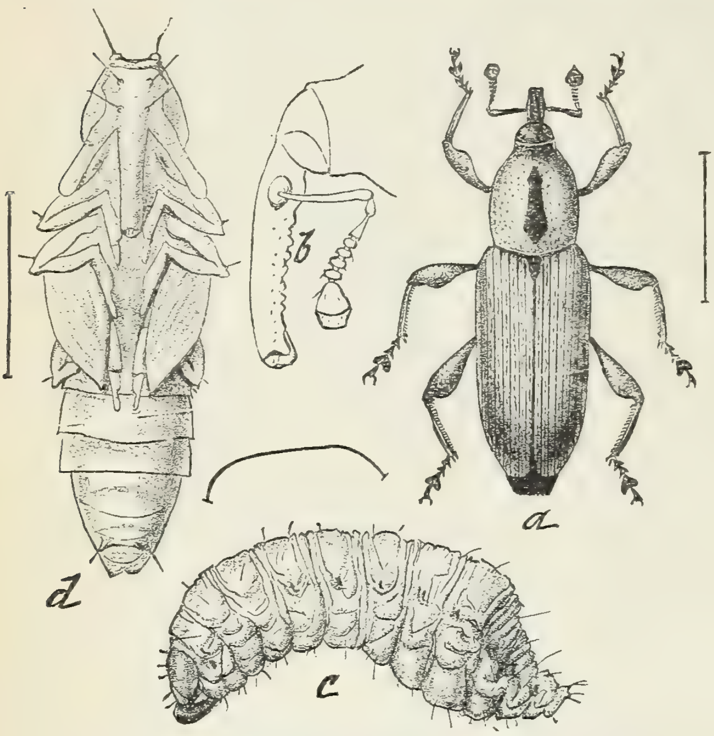


FIG. 44.—SPHENOPHORUS OBSCURUS. *a*, adult, enlarged; *b*, head of adult, from side, still more enlarged; *c*, full-grown larva, from side; *d*, pupa, ventral view, both enlarged (original).

Genus CXXVI. *Sphenophorus* Mun. Cat., VIII, p. 2646. 360. *Calandra obscura*, Boisd. Voy. Astr. II, p. 448. Fairm. Rev. Zool., 1849, p. 474.

Ins. Oahu. Introduced. Tahiti, New Ireland. In the stems of banana, on the mountains. This insect is apparently omitted in the Munich Catalogue of Coleoptera.

Dr. Sharp further wrote that his original identification of the species was made from Boisduval's deficient description and from Fairmaire's paper, and from a specimen so named by Jekel, in the British Museum collection. After receiving our specimen (which was a male, while the Jekel specimen was a female) Dr. Sharp found both sexes of the same species among som e specimens recently sent him from Tahiti by Mr. J. J. Walker, who found them under the bark of a species of *Musa* (Banana).

The species belongs to Schoenherr's and Lacordaire's genus Sphenophorus, and should be included in the group having the third tarsal joint large and pubescent beneath. The disintegration of this large genus, already indicated by Schoenherr and more strongly advocated by Lacordaire has been accomplished in more recent times by Dr. Horn, Dr. Le Conte, Mr. Pascoe, and especially by Mr. Chevrolat. The work of the latter author (published in the Ann. de la Soc. Ent. de France, 1882 and 1885, partly after Chevrolat's death, the whole being evidently incomplete and unfinished) is of such unsatisfactory and unsystematic character that the generic determination of a single species is next to impossible without having access to the types.

Although we can not place our species in any of the numerous genera erected by Chevrolat at the expense of the old genus Sphenophorus, it

*Published in Trans. Royal Dublin Soc. (2) III, 1885, pp. 119–300.

seems best to leave the generic determination to a future monograph of this group, and we prefer to leave the species in that genus under which it was originally described. In order to facilitate the recognition of this species, which has been described in publications not readily accessible, we append a description of the imago by Mr. Schwarz which he has drawn up at our request to accompany these notes.

Generic characters.—Rostrum slender, moderately curved beneath, in the male with impressed median line and two longitudinal rows of rounded tubercles. Antennæ sub-basal, funicle 6-jointed, first joint longer than wide, second longer than the first, the following sub-transverse gradually becoming larger; club hardly securiform and moderately compressed, spongy portion nearly two-thirds as long as smooth portion and obliquely truncate each side. Eyes transverse, flat, not contiguous beneath. Prosternum between coxæ not linear and about half as wide as the diameter of the coxal cavity. Scutellum elongate, flat. Mesothoracic epimera not ascending, obtuse at outer anterior angle. Legs rather stout, femora thickening apically and strongly sinuate at tip; tibiæ not curved, longitudinally carinate, on inner side fringed with very short setæ; third tarsal joint large, entirely spongy pubescent beneath, second and third joints spongy pubescent at tip. Abdomen with 5 segments. Closely allied to *Cactophagus*, with which it agrees in the form of the antennal club and the third tarsal joint but differs in the shorter beak, which is bi-seriately tubercled beneath in the ♂; second joint of funicle longer than first; scutellum elongate, legs stouter with clavate femora, tibiæ longitudinally carinate.

Specific characters of ♂.—Length from tip of thorax to tip of elytra 13.5 millimeters. General color rufo-piceous (perhaps immature). Beak as long as thorax, but little compressed, gently dilated at basal third; above rather finely and densely punctate, more coarsely at the sides; a small frontal puncture; beneath the impressed median line becomes deeper and wider toward the base, the tubercles forming the row each side of the median line smooth and rounded and more numerous at tip than posteriorly. (Fig. 43, *b*). Head sparingly and finely unctate. Antennal scape opaque and tomentose, first and second joints of funicle smooth except at tips, the remaining joints opaque, nearly moniliform; smooth part of club with a row of coarse setigerous punctures near the base. *Thorax* distinctly longer than wide, basal margin rounded, sides straight from base to beyond the middle, thence arcuately narrowing; a well-marked, short tubular constriction at tip, front margin straight; surface shining, even, except a slight ante-basal median depression; rather finely punctulate on disc, with an ill-defined longitudinal smooth space at middle, punctures larger toward the sides and especially in the ante-basal depression, basal margin densely punctured; color orange-yellow with rather broad black median stripe not reaching apex and base; flanks more opaque with two large black patches. Scutellum elongate, acute at tip, surface even. Elytra sub-opaque at base, as wide as base of thorax, nearly 1½ times as long as thorax and twice as long as wide; humeri obliquely truncate, sides feebly converging posteriorly, separately rounded at tip; sub-opaque; color (immature specimen?) dirty piceous-yellow with indistinct black marking (especially a large longitudinal stripe toward the sides); punctate-striate, striæ moderately deep, the punctures remote and not strong; suture at base with a row of fine punctures, rest of suture and the other interstices each with a series of small tubercles which are sometimes rounded but more often (especially posteriorly) confluent into little longitudinal carinæ of varying length. Pygidium sub-triangular, longer than wide, sub-truncate at tip, longitudinally convex, sub-opaque, densely punctulate at base, very coarsely and more sparsely at apex. Underside reddish piceous, somewhat shining; pro- and mesosternum coarsely punctured, the former without impression (except the apical constriction), the latter with moderately deep notch at middle, opaque and sparsely punctured at sides; first abdominal segment as long as

the last and both densely and coarsely punctured; segments 2–4 rather finely punctured at middle, more coarsely at the side, segment 2 a little shorter than the first, 3 and 4 equal, each shorter than the second. *Femora*, orange-yellow trochanters and tip of femora black; tibiæ dirty brownish yellow, simple (not bi-spinose) at tip, tarsi piceous.

The structure of the head, mouth-parts and the transverse folds of the segments of the larva (Fig. 43, *c*) agrees with that of *Sphenophorus robustus*, described and figured by us in our Annual Report for 1881–'82, (p. 141–142, pl. VIII, Fig. 2, *a*) but is distinguished at once by the rather sudden enlargement of abdominal segments 4, 5, and 6, the fifth being especially large and bulging. In this respect it resembles the larva of *Sphenophorus liratus* as described and figured by Ch. Coquerel (Ann. Soc. Ent. France, 1849, p. 455–456, Plate VIII, Fig. III, 2), but in the latter species the enlargement of the abdominal segments is said to be gradual. The thoracic and anterior abdominal spiracles are as in *S. robustus;* the sixth and seventh pairs are, however, more dorsally placed and the eighth pair is entirely dorsal, somewhat obliquely placed and as large as the prothoracic spiracles. The last segment is broadly truncate at middle of apex, the truncature being accompanied each side by a shorter oblique truncature. The four angles thus formed are marked each by two long setæ, one placed above the other.

The pupa (Fig. 43, *d*), while resembling in general shape that of *S. robustus*, is distinguished by the stronger armature of the head. The two setigerous frontal tubercles are very prominent and surrounded anteriorly by a crescent-shaped ridge in front of which is a small setigerous tubercle. The tubercles near the base of the beak are also more prominent. Near the hind angles of the thorax are each side two rather large, blunt tubercles, and another obliquely placed pair of smaller tubercles on each side of the disc toward the anterior angles; two small tubercles are also at the middle of the anterior margin. The armature of the pygidium (seventh dorsal abdominal segment) consists of a single row of rather large setigerous tubercles, and the last ventral segment is truncated at tip, terminating each side into a bi setose cone-like process. The prothoracic spiracles are very large and conspicuous.

Judging from the specimens of sugar-cane received from Mr. Wickson the damage caused by the beetle must be very great since the stalks were completely riddled with the galleries of the larvæ, several of the latter being in a piece of cane about 8 inches long. The galleries (Fig. 45) are wide when compared with the diameter of the larva, and not long, mostly running longitudinally, but some also across the cane. They are filled with macerated fiber which the larva apparently pushes behind itself. When ready to pupate the larva somewhat enlarges the channel and forms a coarse cocoon of fiber in which the transformation takes place. The outside of the infested cane (Fig. 44) shows several small round holes which probably represent the place where the egg has been inserted by the parent beetle, and several large, oblong openings which are probably the exit holes of the emerging beetle.

As we received no other notes on the natural history of the species we can say nothing as to time and mode of oviposition, the duration of the larval state, hibernation, etc. The only other information is that contained in the quotation from Blackburn and Sharp's Memoir on the Hawaiian Coleoptera, viz: That the species attacks also banana stems, and further that it has been introduced (no doubt with sugar-cane or banana plants) from other islands in the Pacific Ocean.

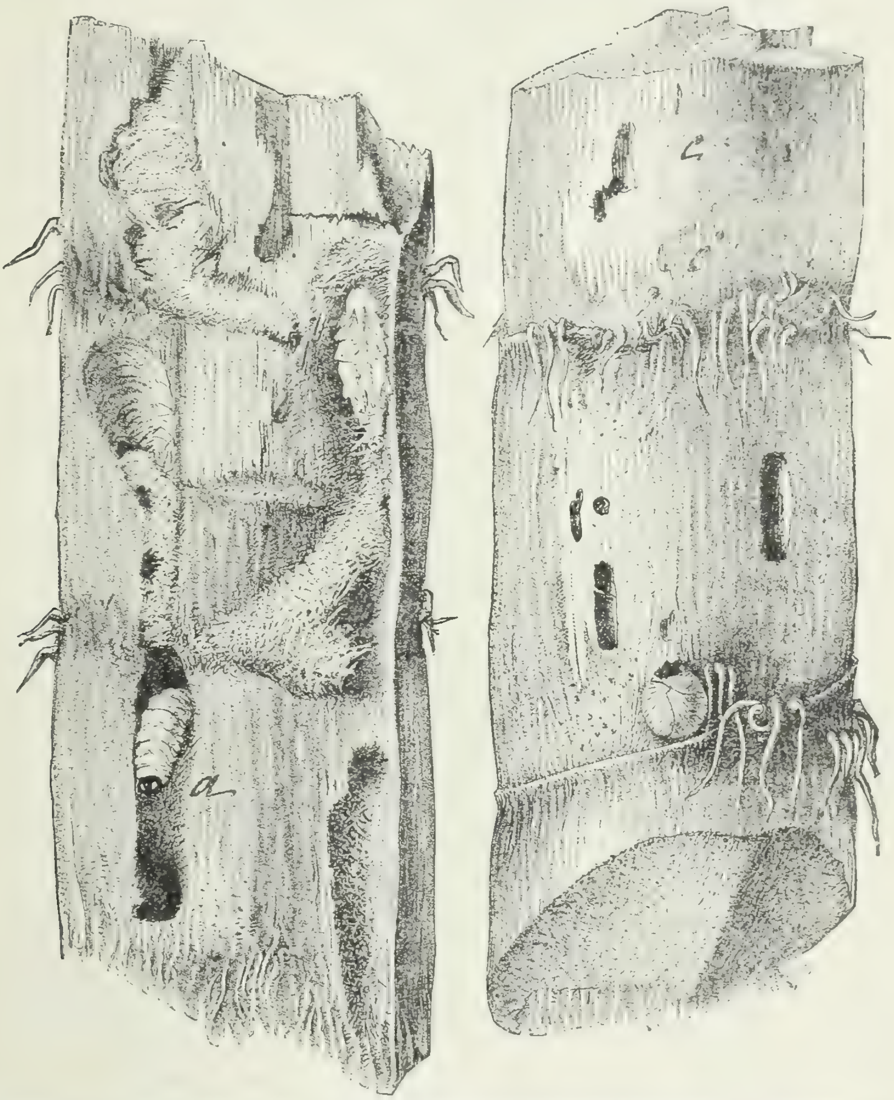


FIG. 45.—Sections of sugar cane showing work of *Sphenophorus obscurus*: *a*, larva; *b*, pupa, in situ, *c*, probably points of oviposition, somewhat reduced (original).

In the absence of any more definite information it is difficult to suggest any preventives or remedies for this pest. Since the larva apparently works in the lower part of the canes and probably also in the roots, many larvæ will no doubt remain in those parts of the plants after the rest of the cane has been cut and carried off to the sugar-houses. The remaining stubble should be carefully examined and all infested stumps destroyed. The same should be done with all diseased or dying banana plants.

Since neither sugar-cane nor bananas are cultivated in California there is little danger that this Sphenophorus will become acclimated in that State from the Sandwich Islands.

EXTRACTS FROM CORRESPONDENCE.

The "Red Bug" injuring Oranges again.

I send you by this mail a small box containing what to us is a new insect, which attacks and is most destructive to the fruit of the Orange tree. It has but recently appeared, and, as far as I know, is confined to a few trees in a large grove joining our place in the east. The fruit has nearly all fallen from the first tree attacked, and in this tree there are thousands of the insects, which are now mostly engaged in reproducing the species. The oranges are covered with them, and they follow the fruit to the ground, being as thick in that as what is on the tree. They are not injurious to the tree, as far as I can observe, though they swarm upon the trunk and branches. Their proboscis is of sufficient length to penetrate through the thick skin of the orange, so that they appear to feed upon the juice only. I urged the owner of the grove to spray the trees with hot water, and finally have his promise to do so upon my furnishing the outfit and he the water. I expect I can get him at it to-morrow.—[A. L. Duncan, Dunedin, Hillsborough County, Fla., November 8, 1888.

REPLY.— * * * The insect which you send and which is damaging your neighbor's oranges, is the common "Red Bug" or "Cotton Stainer" (*Dysdercus suturellus*). The normal food of this insect is cotton, and its original home is probably in the Bahama Islands or the West Indies. It has long been known, however, as a Florida insect, and many years ago seriously damaged the cotton crop both in this State and upon the sea islands of Georgia. Its first appearance as an orange destroyer, so far as we know, was in 1879, and you will find some short account of it in the Annual Report of this Department for that year. So far as our experience goes this insect only damages oranges near which cotton is grown, and we should be interested to learn whether this is the case with your neighbor's oranges. The worst damage has always been during a season in which the bugs have multiplied profusely upon cotton, and after picking have migrated to the neighboring orange trees. It has been noticed that the bugs accumulate in great numbers, especially during cold nights, upon heaps of cotton seed outside the gins, and this has suggested that as a remedy small heaps of cotton seed might be placed at intervals through the groves, and in the early morning the bugs which have collected upon them might be destroyed by the use of hot water. Your advice to your neighbor is good, but you will probably find that spraying the insects with a dilute kerosene emulsion made according to the Hubbard formula will be more efficacious than the hot water alone. * * * —[November 14, 1888.]

Further Injury in the Treasury by Roaches.

Allow me to introduce Mr. E. Hergesheimer, Chief of Drawing Division, who will tell you about our trouble with pests of the same nature as infested your records. Please give him the benefit of your experience.—[B. A. Colonna, Assistant Chief U. S. Coast and Geodetic Survey Office, to E. B. Youmans, Chief Clerk Treasury, September 18, 1888.

Respectfully submitted to the Honorable Assistant Secretary, with recommendation that this matter be referred to the Department of Agriculture for such advice as that Department may be able to give, looking toward relief from the pests mentioned.—[E. B. Youmans, Chief Clerk, to Hon. Hugh S. Thompson, Assistant Secretary of the Treasury, September 18, 1888.

Respectfully referred to the Honorable Commissioner of Agriculture with request that he will have this matter investigated by the Entomologist of his Department, and such action suggested by him as will lead up to the object desired.—[Hugh S.

Thompson, Assistant Secretary of the Treasury, to the Honorable Commissioner of Agriculture, September 18, 1888.

REPLY.—The letter from Mr. B. A. Colonna, introducing Mr. Hergesheimer, accompanied by drawing of map injured by insects, and referred by you to this Department, has been received and referred to the Entomologist. He replies as follows:

"The drawing injured is that of a map made on tracing cloth, the lines of red, blue, and green pigment having been eaten as well as patches in places not touched by ink. This injury has been done by the Croton Bug, *Ectobia germanica*. These insects are well known to attack anything that has any paste in its make-up. As a remedy for them use the Pyrethrum powder or California Buhach. It should be sprinkled wherever the roaches run, and on them if possible. The best time to do this is in the evening, so that the application will be made just before they begin to run. * * If this remedy is used thoroughly and persistently it will surely afford relief. * * This and the large species, *Periplaneta americana*, were investigated and reported upon in the Treasury by this Division in May last. * *"—[F. C. Nesbit, Acting Commissioner of Agriculture, to Hon. Hugh S. Thompson, Assistant Secretary of the Treasury, September 19, 1888.]

Beetles supposed to have been passed by a Patient.

The five insects sent herewith seem to me to be three different kinds of beetles. History: They were sent to me by a reputable physician of southern Illinois. He says they were found in the stools of a patient—a lad working on a farm; that this is the third time that they have been found; that they followed the administration of a saline cathartic. Please name for me, give their habits, etc., and I shall be under many new obligations.—[J. M. Shaffer, M. D., Physician to Board of Health, Keokuk, Iowa, August 31, 1888.

REPLY.—Yours of the 31st ultimo, with specimens of beetles supposed to have been passed by a farm boy in southern Illinois, has at last come to hand. * * * The beetles are of three different species, viz, *Onthophagus hecate*, *O. pennsylvanicus*, and *Aphodius granarius*. These beetles are all found in manure and dung of different animals, and I consider that, without question, they must have entered the stools of the boy *after* the latter had been passed. It is very unlikely that he passed the insects themselves.—[September 18, 1888.]

A Tineid on Carpets in Texas.

I have sent you by this mail a small box containing some kind of a bug; I do not know much about them. In the first place, I live in a rock house (my reason for telling that is because I never saw them in a wooden one). They are to be found along the edges of carpets, on the furniture generally, as though eating the veneer; their favorite haunt is in and around the fire-place; they also go up the chimney in large numbers. What are they?—[David Hampton, Burnet, Tex., October 6, 1888.

REPLY.— * * * These insects are very interesting and are new to our collection here. They are cloth-feeding Tineids, but the species we can not determine until we have reared the moth. Can you not send another supply of specimens? You do not mention whether they seem to do any damage to your carpets, and I wish that you would inform us on that point. Please send a large lot of specimens before you begin to destroy them, and you can probably kill them easiest by a free use of California Buhach.—[October 22, 1888.]

Leaf-stripping Ants in Arizona.

Can you give me any information that will help me to destroy the leaf-eating ants? They are very thick on my ranch, and I don't know what to do to get rid of them. It seems impossible to kill them in the ground. They are a medium-sized red

ant, and they throw up little mounds and seem to do nothing only to eat leaves. They will strip a tree of every leaf in one night. They have done so much damage to my nursery that I have got to go to work and destroy them if possible. If there is any way that will fix them please let me know. * * * —[D. Turner, Paradise Nursery, Phœnix, Maricopa County, Ariz., October 27, 1888.

REPLY.— * * * While it is impossible to say with absolute certainty just what species you complain of, it is in all probability the Leaf-eating Ant of Texas (*Œcodoma ferens*). Inasmuch as you state that you are able to find easily the mounds which they make, your best plan will be to attack them with bisulphide of carbon, which you can use in the following manner: Having secured a pound or so of this volatile liquid, thoroughly wet a large blanket with water, pouring perhaps a tablespoonful of the bisulphide into each of several of the larger holes in the mound; then throw the wet blanket over the mound, allowing it to remain for from ten to fifteen minutes. Then remove the blanket and by means of a lighted kerosene rag at the end of a pole explode the bisulphide vapor at the mouth of the holes into which you have poured it. The rationale of this operation is as follows: The bisulphide vapor being heavier than the air sinks down through the burrows of the ants and the explosion forces it in every direction, upwards and sidewards, through the burrows and it is instant death to every ant with which it comes in contact. Repeat this operation with every mound which you find, and although the trouble will be considerable you will succeed in eradicating the pest. Be careful, however, in handling the bisulphide, as it is very volatile and inflammable. Should you try this remedy, please inform us of the result.—[November 3, 1888.]

The Hessian Fly in England.

* * * I found the puparia (Hessian fly) in almost every field around Strand, which is, so far as I know, the most westerly point from which it has been reported. I also caught three males on a window of the house where we were staying.

One of the curiosities I met with near Bham was a farmer who was "perfectly satisfied with the crop of wheat;" who would not have anything taken out of his field—no! not the "'Essen fly"; and who wanted to lock me up for trespassing in his stubble field. Whose fault is it that these *British* farmers are utterly ignorant as to the appearance of an infested crop? What use is a stupid report and list of places where the fly has occurred? From puparia collected August 5, 1887, I bred the last Cecid. September 21, 1888. Truly this is a queer bug.—[Fred. Enock, London, England, October 13, 1888.

Stinging Caterpillar of Lagoa opercularis.

I send you by mail to-day a worm or caterpillar found upon a rose-bush. On Sunday last a patient came to me with evidences of poisoning inflicted by a similar caterpillar; the face was affected, redness, swelling, and great and intense pain. Same readily passed off, but was very intense. Please let me know something of the "beast," name, etc.—[H. B. Horlbeck, Department of Health, Charleston, S. C., October 23, 1888.

REPLY.—The caterpillar in question is one of the so-called stinging caterpillars, and this particular species is *Lagoa opercularis*. Underneath the long silky hairs which you notice are concealed shorter stiff hairs, exceedingly sharp at the points, which produce a nettling when they penetrate the flesh. This caterpillar is quite common from New Jersey southward, and feeds upon a great many different plants. There are generally two annual generations and the insect passes the winter in its cocoon. The moth is yellow in color, tinged with brown.—[October 26, 1888.]

Rebuttal of Wier's Statements regarding the Plum Curculio.

Following the line of investigation, as a rebuttal of D. B. Wier's statements regarding the behavior of the Plum Curculio I am able to furnish the following report, based upon close observation of a few of our practical men during the present season:

(1) There has been no preference discovered as to the varieties of plums attacked.

(2) A large portion of the eggs deposited in the Wild Goose Plum failed to hatch, but enough did to destroy about two-thirds of the crop.

(3) Native varieties (wild) of plums are no more exempt than those in the cultivated grounds.

Spraying with London purple.—This work was begun as soon as the blossoms appeared and followed up to the time the fruit was fully formed. In the same orchard several trees were omitted in the spraying treatment, and as large a per cent. of sound fruit was gathered from them as from those sprayed. The solution was sufficiently strong to burn some of the leaves, as it was my privilege to observe.

The Bag or Basket Worm has been quite numerous at Parsons, Kans., this year upon large Red Cedar trees. Spraying with London purple has been thoroughly applied and failed. Can you advise any other means besides hand-picking?—[G. C. Brackett, Kansas State Horticultural Society, Lawrence, Kans., September 25, 1888.

GENERAL NOTES.

GRAIN INSECTS IN AUSTRALIA.

Just at present the colony of South Australia is considerably exercised over the Hessian Fly and other grain insects. Last July we received a communication from Mr. F. S. Crawford asking for our opinion concerning the importation of the five principal grain pests from Europe and from this country into Australia in grass hay. We replied that from the life habits of the insects we imagined that there would be little or no danger respecting the Wheat Midge (*Diplosis tritici*), the Ribbon-footed Corn-fly (*Chlorops tæniopus*), or the Wheat Saw-fly (*Cephus pygmæus*). The Hessian Fly (*Cecidomyia destructor*) and the Joint-worms (*Isosoma* spp.), however, might be so imported, as both hibernate in the straw. We also informed him that in our opinion a restriction compelling the burning of straw or hay packing would be far preferable to any legislation for preventing the importation of goods so packed, as in the former way no disturbance to commerce would result and the scheme could be so much more easily carried out and practically enforced. If the packing should be simply grass hay, the danger would be much slighter than if wheat, rye, or barley straw were used.

The matter was brought before the meeting of the Bureau of Agriculture at Adelaide, on September 17. It seems from the report that none of the insects in question have as yet made their appearance in the colony, although the recent well-founded scares in England and in New Zealand have suggested to the Australians the necessity for the utmost precautions. Against the measures suggested as preventives of the fly's introduction it was contended that too much importance was attached to the alleged risk, and that it would be a most serious

matter to commercial men if the proposed packing restrictions were put into force. The question of the action to be taken by the neighboring colony, Victoria, was also brought up, and the necessity for united action was put forth; for if one colony prohibited certain packing and the other did not, the latter would gain a commercial advantage; hence, a conference between delegates was suggested. The following motion was finally carried:

> That the bureau are of the opinion that to check the introduction of the Hessian Fly and kindred dangerous insects it would be necessary to prohibit the importation of all goods packed in straw of cereals of any kind. This would result in a great loss and inconvenience to our South Australian importers, and the bureau would recommend that an inspector under the vines, fruits, and vegetable protection act confer with the officers holding similar appointments in the adjacent colonies, with a view of their Governments arriving at some common act.

Our own suggestion had at that time not been considered, and Mr. Crawford, in writing to us under date of September 30, raises the objection that although at first it might seem the best way out of the difficulty, he is afraid that in practice it would be found a greater evil than limiting the packing to certain vegetable products, because all earthenware, china, glass, etc., would have to be unpacked and repacked in bond, which, of course, would be strongly objected to by importers; or if the straw were burned on the importers own premises it would be necessary to have a customs officer or inspector present to see it done.

It strikes us after considering this objection that the best and safest way out of the difficulty is to combine the two suggestions and restrict the packing material to certain safe substances *under penalty* of having straw packing burned at the custom-house and at the risk in unpacking and repacking of the importer. It seems to us, moreover, that if the Hessian Fly does not make its appearance in Australia during or immediately after the present year of the Melbourne exposition, when so much merchandise from this country and from England has been carried over, we may reasonably expect exemption for years to come.

Many kinds of packing material are in common use in this country and the restriction as to the kind of packing would probably not work to the serious disadvantage of American exporters.

FURTHER CONCERNING THE LOCUST WAR IN ALGERIA.

Mr. J. Künckel d'Herculais, President Entomological Society of France, has addressed a report to the Governor-general of Algeria upon the subject of the Locusts and their invasion of Algeria. The particular conclusions at which Mr. d'Herculais arrives are as follows:

(1) The necessity of organizing, after the example of the Americans and the Russians, a permanent scientific service, charged with the study of the Migratory Locusts; study of the habits of different species; researches upon the centers of multiplication; the providing of maps (tracé de cartes) of prevision of invasions and of maps of the progress of invasions; researches upon the natural causes of destruction; researches upon the practical methods of destruction.

(2) The necessity of organizing a service trained in the handling of different apparatus and in implements and methods of destruction.

(3) The necessity of providing resources by the establishment of a special tax after the example of the English in the island of Cyprus.

These conclusions were recommended by the Agronomic section of the French Association for the Advancement of Science March 30, and the whole association in general assembly April 3, sanctioned the propositions of the section. As a result the President of the French Entomological Society has been charged by the minister of public instruction, at the request of the Governor-general of Algeria, with the organization of a scientific commission for the study of the locusts which ravage the French Algerian colony.

AN IMPORTANT CONTRIBUTION TO LEPIDOPTEROLOGY.*

This paper gives a review in monographic form of a very interesting group of species. All the species heretofore described are noted here, while a considerable number of species are for the first time characterized. Lord Walsingham says "Anophorinæ," and in his introductory remarks gives the characters of the group so termed. The number of genera is increased from three to thirteen, and the characters are structural. The genera are therefore easy of determination, if somewhat numerous. A leading character is the apical vein, which is said to be either forked or not forked. The number of American species is increased from eight to seventeen. One noteworthy feature of the paper is that the male genital organs are described for almost every species, putting them on a sound basis in every respect. Figures of the most of these structures are also given. In the terminology of the parts the words "uncus" and "clasper" are employed. We shall have some remarks on the nomenclature of these parts in some future number.

The arrangement of the American species, according to the result of Lord Walsingham's studies, is as follows:

Neolophus Wlsm., gen. nov.
  furcatus Wlsm., sp. nov., Arizona.
Eulepiste Wlsm.
  cressoni Wlsm., Texas.
  maculifer Wlsm., sp. nov., Arizona.
Hyloclopus Wlsm., gen. nov.
  griseus Wlsm., sp. nov., Arizona.
Acrolophus Poey.
  simulatus Wlsm., Texas.
  plumifrontellus Clem., North Carolina, Massachusetts, New York.
    bombycina Zell.
  mortipennellus Grt., Central Alabama.
  cervinus Wlsm., sp. nov., Texas.
  texanellus Chamb., Texas.
  arizonellus Wlsm., sp. nov., Arizona.
Anaphora Clem.
  morrisoni Wlsm., sp. nov., Florida.
  propinqua Wlsm., sp. nov., Florida.
  popeanella Clem., Missouri, Texas, North Carolina.
    agrotipennella Grt.
    scardina Zell.
  tenuis Wlsm., sp. nov., North Carolina.
  macrogaster Wlsm., sp. nov., Arizona.
Felderia Wlsm., gen. nov.
  filicornis Wlsm., sp. nov., Arizona.
Ortholophus Wlsm., gen. nov.
  variabilis Wlsm., Arizona.
Pseudanaphora Wlsm., gen. nov.
  arcanella Clem., Minn.

*A revision of the genera *Acrolophus* Poey, and *Anaphora* Clem. By the Right Honorable Lord Walsingham, M. A., F. Z. S., etc. Trans. Ent. Soc., Lond., 1887, pp. 137–173, pl. VII and VIII.

THE POISONOUS NATURE OF THE MECONIUM OF LEPIDOPTERA.

Mr. Th. Goosens, at the meeting of April 11 of the French Entomological Society, read a note upon the Meconium of Butterflies. It seems that he had in a bottle some chrysalids of *Vanessa prorsa.* There were also in the bottle some caterpillars of *Fidonia atomaria*, but these were in a tube, and the tube had a cork stopper. One of the Vanessas issued, spread its wings, and, ready to take its flight, ejected the meconium amassed in its chrysalis state. This matter fell upon the stopper and immediately killed the twenty caterpillars. The experiment was repeated by placing a little of this liquid in a bottle with another lot of caterpillars, which also perished. Larvæ, however, placed in contact with the dry meconium lived as usual. His conclusion was that it is probably the evaporation of the substance, which is composed in a large part of uric acid, which has the property of killing caterpillars, and that its poisonous action is often the unsuspected cause of the death of larvæ in breeding-cages.

THE PEACH-TWIG MOTH AND ITS PARASITE.

Popular Gardening for July, 1888, reports a so-called " new enemy to the Peach " in Delaware and Maryland, which is said to be a worm from one-quarter to three-eighths of an inch long, and about as thick as a pin. It feeds on the leaf, buds, and ends of the young shoots, which of course kills the tips of the twigs. Some orchards in Kent and Sussex Counties, Delaware, are said to look as if a fire had passed over the ends of the twigs and scorched the leaves. The origin and habits of the pest are said to be not yet known, while the area over which it appears is said to be limited.

It seems from reading this item that this is by no means a new enemy, but that it is the old and well-known *Anarsia lineatella* Clemens. This insect was mentioned in the Annual Report of this Department for 1872, by Mr. Glover, as having done a great deal of damage in the vicinity of the Maryland Agricultural College in May of that year. Almost all of the twigs of the trees were observed to be killed at the end. The moth was bred and identified and the insect studied in all stages. Apple trees were observed to be damaged in the same way, supposably by the same insect.

Our notes show that adult insects issue during May and June and the next brood infests the fruit of peach. The larvæ are found during the latter part of July and August and mature during September. The larva leaves the fruit before transforming and suspends itself to the outside of the fruit. The first full account published is by Professor Comstock, in the Annual Report of this Department for 1879, page 255. According to the Annual Report of the Entomological Society of Ontario for 1872, Mr. William Saunders has found the same larva boring in the roots of Strawberry in Ontario. Mr. Lintner, in

his first report as State Entomologist of New York, published in 1882, has a rather extensive article upon the same subject, and records peach twigs as damaged at five localities in the State of New York, so that the insect is far from being a new pest. The best remedy will be to clip and burn the infested twigs as soon as they are noticed in May. In Professor Comstock's article, before-mentioned, it is said that a Chalcid parasite was bred from this insect. The specimens of this parasite we have had in the Department collection for all these years under the MS. name of *Copidosoma variegatum*, and in Bulletin 5 of this Division, in which we described a number of species of this genus, this one was overlooked. We take this occasion to submit a formal description:

Copidosoma variegatum sp. nov. Howard.

Female.—Length, 0.93^{mm}; expanse, 2.2^{mm}; greatest width of fore-wing, 0.49^{mm}. Club of antennae flattened, rounded at tip, as long as all of the other funicle joints together; pedicel twice as long as first funicle joint. Punctation of head and thorax as in *C. gelechiæ*. Marginal vein of fore-wings entirely wanting. General color black, with brilliant metallic green luster; scape of antenna black, white at tip; pedicel black; first four funicle joints white; joints 5 and 6 of funicle brown; club brown; all coxæ metallic; all femora and tibiæ dark brown, white at tips; all tarsi white.

Described from six ♀ specimens, all bred from a single larva of *Anarsia lineatella*, which was inflated as are the larvæ which harbor other species of Copidosoma.—L. O. H.

TWO ABNORMAL HONEY-BEES.

At the meeting of the Entomological Society of France May 23, Mr. H. Lucas exhibited two specimens of the common Honey-bee, which were collected near Bordeaux and which were remarkable from the fact that in the one the left eye is small, while the right eye, on the contrary, is strongly developed and even extends beyond the median part of the front. With the other specimen the exact contrary occurs, and it is the left eye which is more developed than that of the right side, which is plainly smaller. On account of this extremely remarkable anomaly it could be said that these bees, from this character, belong upon the one side to the male sex and upon the other to the neuter.

RE-APPEARANCE OF LACHNUS PLATANICOLA.

This year we have noticed an abundance of the large Sycamore Tree-louse, *Lachnus platanicola* Riley (fam. *Aphididæ*), on the Sycamores, or Western Plane-trees, in Washington. A number of trees along the walk bordering the west side of the Capitol Grounds were found infested with them in September, the insects being principally on the smaller, lower branches, clinging in large patches to the bark, while the pavement below was stained with the exudations which had dropped from their bodies in such quantities as to form miniature pools on the sidewalk. At this time the individuals composing the patches represented

all the early stages, varying from very small ones up to nearly full-grown specimens, none however being winged.

In October several trees on La Fayette square, in front of the Cosmos Club, were also noticed to be infested, the brick walk beneath being similarly stained by them.

This species was described by Professor Riley in 1883, in the *American Naturalist* for February of that year, with a notice of its excessive abundance in 1882, not only in Washington, but in many other parts of the United States.—T. T.

TWO ALIEN PESTS OF THE GREENHOUSE.

Of the food habits of the adult Locust Borer very little appears to have been observed, although they are known to frequent the blossoms of *Solidago* during September.

On two occasions these beetles have been brought to me by the florist of Purdue University, with the complaint that they were found in the greenhouse eating the leaves of roses, and in no case were they observed to molest other plants.

On October 11 complaints came from the same quarter regarding a bug which clustered on the buds of Chrysanthemums, causing the latter to discolor. Inspection revealed the depredator to be the Tarnished Plant-bug, in the pupal and adult stages, the latter predominating. These were not observed to attack any other plant, and were destroyed by fumigating with tobacco smoke.—F. M. W.

[We doubt the accuracy of the observation as to *Cyllene robiniæ* eating rose leaves.—Eds.]

THE FOOD-HABITS OF NORTH AMERICAN CALANDRIDAE.

We take this opportunity to publish (suggested by our article on the Sandwich Island Sugar-cane Borer) a short review of the food-habits of the North American Calandridæ, to which family the genus *Sphenophorus* belongs, derived both from published records and our own notes. As will be seen, there is considerable diversity even among the comparatively few genera of our fauna.

The genus *Calandra* infests stored grains (wheat, corn, rice, etc.).

The genera *Dryotribus*, *Gononotus*, *Macrancylus*, *Mesites* (?), *Elassoptes* are strictly maritime and live in larva and imago states in old boards, roots, etc., washed up on the beach.

The genera *Dryophthorus*, *Himatium*, *Cossomus*, *Allomimus*, *Caulophilus*, *Phlœophagus*, *Wollastonia*, *Amaurorhinus*, *Rhyncolus*, *Stenoscelis* live under bark of dead and decaying wood, or bore into decaying wood of deciduous or coniferous trees.

Rhodobœnus 13-*punctatus* infests the stems of various plants, *Xanthium strumarium*, *Ambrosia*, and Thistle.

Cactophagus validus has been found exclusively under decaying *Opuntia* leaves, the larva no doubt living within the leaves or roots of the same plant.

The genera *Yuccaborus* and *Scyphophorus* infest plants of the genus *Yucca*.

The genus *Rhynchophorus* infests palmetto trees.

The genus *Sphenophorus* infests the roots or lower part of the stems of various wild or cultivated Graminaceous plants. One or perhaps several species are strictly maritime.

A small number of genera remain of which the food-habits are still unknown.

THE NATURAL FOOD PLANT OF GRAPTODERA FOLIACEA Lec.

Miss Murtfeldt's interesting observations on this species (p. 74) show that it feeds greedily on the foliage of the apple tree, and on the authority of Professor Riley it is stated also to feed on hawthorn. Possibly it is not confined to any group of plants, but it may be worth mentioning that I found specimens of a beetle, referred by Professor Riley to this species, in considerable abundance on *Cucurbita perennis* Gray, at Cottonwood Springs, Pueblo County, Colo., last August. They appear to be entirely confined to the Cucurbita, and one might have supposed that it was their proper food-plant under ordinary circumstances. I have not yet heard of their doing damage to the cultivated melons, squashes, etc.—T. D. A. Cockerell, West Cliff, Colo., October 14, 1888.

A REMARKABLE INSECT ENEMY TO LIVE STOCK.

The numerous published accounts of the loss of life not only of stock, but of human beings, from the sting of the Whip-tailed Scorpion (*Thelyphonus giganteus*), and the consequent popular names of "Nigger-killer" and "Mule-killer" are sufficiently absurd to those who know its harmless nature; but there is some little excuse for such tales on account of the close resemblance of the animal to the true scorpions, which are, in reality, more or less poisonous. No excuse, however, can be offered for the statement which was recently sent us from Texas by a correspondent who forwarded a specimen of *Mantis carolina* with the information that a gentleman told him he had lost a valuable horse by one of these insects. We would, therefore, suggest as a new popular name for this Mantis, "The Texas Horse-killer!"

FURTHER ON THE IMPORTATION OF LESTOPHONUS.

Just as we are going to press we learn from Mr. D. W. Coquillett, our agent at Los Angeles, Cal., that he has received Mr. Koebele's shipment concerning which we quote Mr. Koebele in the Special Notes of this number. A tent had been placed around an orange tree in anticipation of the arrival of the parasites. The boxes were taken inside the

tent and opened. Up to the time of writing sixty specimens of Lestophonus had issued under the tent. In the case of living plants were found living Chrysopa adults and two species of Coccinellid larvæ, also many eggs and cocoons of Chrysopa. The adults of Lestophonus will doubtless continue to issue, and we have every reason to hope that they will oviposit in the Iceryas upon the tree under the tent. Two Coccinellid larvæ were found crawling outside of the case from which they had emerged through cracks in the putty. When transferred to the orange tree they attacked the first Icerya they met.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

December 6, 1886.—An amendment of the constitution, relating to the dues of the various classes of members was discussed and adopted. Mr. S. Lowell Elliott was elected a corresponding member of the Society.

Dr. Marx made a communication on the structure of *Hypochilus*, a form showing intermediate characters between the *Tetrapneumones* and *Dipneumones*. He showed in what features it related to each of these groups, and also that in its nest making habits it combined the characters of both *Territellariæ* and *Tubitellariæ*. He also made some remarks on the characters of the *Dysderidæ*, *Filistatidæ*, and *Ciniflonidæ*, the latter a family which he deems unnecessary, although recognized by Emerton.

Prof. Riley, commenting on this paper, thinks the present bases of division, although apparently disturbed by such forms as that discovered by Dr. Marx, may yet be systematically useful. He also urged upon Dr. Marx the importance of a study of our *Theraphosidæ*. Dr. Marx replied that in this family nothing could be done at present, since the classification now in use was not based upon a study of our fauna, and the characters used were totally inapplicable.

Mr. Howard remarked that he had recently read in the Tr. New Zealand Inst. for 1869, an account of the *katipo*, or poisonous spider of New Zealand, which appears to be a species of *Latrodectes*. This is found on the sea-beach in the sedges, and was not feared by the natives at a distance of half a stone's throw from the water.

Mr. Ashmead said that he had seen a peach orchard defoliated by a spider. He states positively that he has seen the spiders bite pieces out of the leaves, but does not say that he saw them afterward chew the bitten pieces.

Prof. Riley made a communication upon the larvæ of *Leptinus* and *Leptinillus*, showing their relationship to that of *Platypsyllus*. Larvæ and imagos of the former had been found around Washington, in nests of Graphops, and larvæ and imagos of the latter had been found upon the beaver in California. No pupæ of either had been found.

Prof. Riley also made a communication on the habits of *Thalessa*, which is proved an external parasite on *Tremex*. He also gave an account of the egg and of the structure of the ovipositor. He thinks the statement of Messrs. Lintner and Woodward that *Thalessa* also oviposits in the larva of *Datana ministra* was based upon an error of observation, *Heteropelma datanæ*, n. sp., having probably been mistaken for *Thalessa*.

Mr. Schwarz exhibited a *Telamona* having a globular sac projecting equally above and below the surfaces of the carapace. He supposes this sac to be formed by a parasite in a manner similar to that in which *Gonatopus* forms a sac on certain *Rhynchota*. The Society then adjourned.

J. B. Smith,
Recording Secretary.

SPECIAL NOTES.

We have just sent our Indiana agent, Mr. F. M. Webster, to Australia to assist in the collection of the parasites of the Fluted Scale (*Icerya purchasi*), and to write up a report on the agricultural aspects of the Melbourne Exposition. Mr. Webster sailed December 15, and will return to this country in March.

As will be noticed from the third page of the cover of this number, Mr. W. B. Alwood has resigned his position in the Division and Mr. C. L. Marlatt has been appointed. Mr. Alwood has accepted the position of Vice-Director of the Virginia Agricultural Experiment Station at Blacksburg, Va. Mr. Marlatt comes to us from the Kansas State Agricultural College at Manhattan, where he has held the position of Assistant in Entomology.

A number of workers in economic entomology will soon be coming to the front. Under the Hatch experiment-station act, something over twenty of the State experiment stations have been able to appoint an entomologist among the officers. Some of the appointees have been well trained in economic entomology, while others are young men fresh from college with only a general knowledge of the subject. So large a number of men situated in different parts of the country, devoting their time wholly or in part to work which should be original and experimental, can not fail to produce important results. It has long seemed to us that much could be gained through an association of those actually working in this direction, and since this enlargement of the number of workers the desirability of such an association seems to us greater than ever before. Other specialists, as the chemists, the ornithologists, the icthyologists, have their national organizations and their annual meetings to discuss methods of work and fields for investigation.

It seems to us that there should be a national organization of those entomologists engaged in the practical application of the science, meet-

ing, say, once a year, to discuss new discoveries, and particularly to exchange experiences as to methods of work, whether in field or laboratory. Such a coming together of those engaged in kindred work and the consequent interchange of experience and intercommunion could not fail to be productive of good both socially and scientifically. Economic entomology has heretofore greatly suffered by the writings and pretensions of those who have no sort of appreciation of its real value and importance, but who, writing at second hand, upon subjects of which they have no personal knowledge whatever, are just as apt to disseminate error as truth. We should like to get an expression from those of the readers of INSECT LIFE interested in the work as to the desirability and feasibility of such a national organization, and particularly as to how many could attend a meeting once a year in some one of our large cities.

Kerosene Emulsion—An Error corrected.—We have unfortunately been misquoted of late relative to a statement made in the Introduction to our 1886 report. We there stated that where milk is not accessible a satisfactory kerosene emulsion can be made with the white of egg and a little sugar, and gave the most desirable proportions. We notice, however, that *Orchard and Garden* for February, 1888, and other journals on previous dates have published the entirely unwarranted statement that "Professor Riley has had the best results in fighting scale insects with a kerosene emulsion prepared after the following formula," quoting the white of egg and sugar recipe. Our position is thus entirely misrepresented.

It will be news to most entomologists to learn that the Wm. H. Edwards collection of Rhopalocera has been purchased by the Rev. W. J. Holland, of Pittsburg, Pa. The collection of Dr. Holland, as thus enriched, is probably one of the largest as well as typically the most perfect collection of the Rhopalocera of temperate North America. In addition to the collection of Wm. H. Edwards it contains the entire collection of Mr. Theodore L. Mead, and a large number of specimens derived from Morrison, Wright, Behrens, Ricksecker, and other collectors, in all fully 8,000 specimens, representing the nearly 700 species credited to our fauna. As an illustration of the richness of this collection, it may be mentioned that *Lycæna pseudargiolus* is represented by 256 specimens, ranging in their distribution according to their localities from St. Michaels, Alaska, to southern Florida, and from Quebec to Arizona, with a large series of bred specimens arranged according to pedigree from one brood to another, showing the lineage of the seasonal or dimorphic forms.

The Rhopalocera of other lands are well represented, notably by specimens from tropical America, Africa, and Asia, and by fine suites of the

Japanese species, collected in 1887 by Dr. Holland during his visit to Japan as the naturalist of the United States Eclipse Expedition of that year. In all, over 4,000 species of Rhopalocera are found in the collection, the genus Papilio alone having more than 250 species correctly etiquetted in the drawers allotted to them.

In the Heterocera the collection is also rich. By purchase Dr. Holland has obtained the entire collection of the Hypenidæ and Pyralidæ of Japan, made by the late Henry Pryer, of Yokohama. This collection, the formation of which occupied Mr. Pryer seventeen years, is being made the basis of an elaborate monograph of the Pyralidæ of Japan by Dr. Holland, in the preparation of which he will have the assistance of Prof. C. H. Fernald and others.

Recent entomological Publications.—During the past few months a number of very important American entomological publications have been received. We do not feel the same latitude in publishing critical reviews in INSECT LIFE as we should in a private periodical, but important publications should receive some attention at our hands, if only a mere announcement of their publication, for INSECT LIFE reaches a large class of readers whose means of ascertaining just what has been published in an entomological line are otherwise slight.

The first part of Professor Comstock's "Introduction to Entomology" was received some two months since. The title reads, "An Introduction to Entomology, by John Henry Comstock, Professor of Entomology and General Invertebrate Zoology in Cornell University, and formerly United States Entomologist, with many original illustrations drawn and engraved by Anna Botsford Comstock, Ithaca, N. Y.; published by the author, 1888." This first part is a volume of 234 pages, comprising 201 illustrations, and considers the orders Thysanura, Pseudoneuroptera, Orthoptera, Physopoda, Hemiptera, and Neuroptera, leaving the Lepidoptera, Diptera, Coleoptera, and Hymenoptera for the second and concluding part. The work is designed primarily as a textbook. Price $2.

Mr. John B. Smith's monograph of the "Sphingidæ of America North of Mexico" has just been published by the American Entomological Society, Philadelphia. It is a work of 195 pages, based largely on work and material at the National Museum, and is illustrated by nine plates, the plates referring mainly to anal characters and wing-venation.

Dr. Lintner's fourth report on the injurious and other insects of the State of New York has also recently come to hand. Dr. Lintner uses 68 text figures, and his report, including indices, covers 237 pages.

The first and second parts of Mr. Scudder's long contemplated work, entitled "Butterflies of the Eastern United States and Canada, with special reference to New England," have also been received. The work is published by the author and is very elaborate, the illustrations form-

ing a special feature. It is to be issued in 12 parts, each containing 8 plates and about 144 pages of text. The price is $5 per part.

Dr. Packard's Entomology for Beginners appeared in September. It is a condensed treatise of about 350 pages with nearly 300 figures, and is entitled "Entomology for Beginners, for the use of young folks, fruit-growers, farmers, and gardeners, by A. S. Packard, M. D., Ph. D., New York, Henry Holt & Co., 1888." The price is $1.75.

A CONTRIBUTION TO THE LITERATURE OF FATAL SPIDER BITES.

The evidence for and against the possibility of a fatal bite from any of our common spiders is sufficiently confusing. We have, on the one hand, a wide spread impression among people at large that such fatal bites are frequent and a large number of poorly-authenticated newspaper records of cases. On the other hand, we have a general incredul-

FIG. 46.—*Latrodectus mactans*: *a*, adult female; *b*, *c*, *d*, *e*, *f*, *g*, abdomen of different stages and varieties, upper side; *h*, under side of *g*; *i*, adult male. *a*, *e*, *f*, *g*, *h*, and *i* enlarged twice, *c* and *d* three times, *b* four times (original).

ity among entomologists and arachnologists, who require absolute proof before accepting what seems probably untrue, judged from the statements of naturalists who have allowed themselves to be bitten without bad results, not only by many different spiders, but by the very species said to be venomous.

Under these circumstances any well-authenticated case of poisoning is of value, and we place the following facts on record for what they are worth :

In January, 1886, we received for identification from Col. Thomas B. Keogh, of Greensborough, N. C., a specimen of the common *Latrodectus mactans*, a rather large brown spider, with a red spot on its abdomen, with the accompanying statement that a specimen of the same species had killed a man at Greensborough. We publish our reply in full, as it drew out the interesting statement which follows:

Your letter of the 7th instant, with specimens of spider supposed to be identical with a species which has fatally bitten a man in your neighborhood, came safely to hand. I am glad to get this specimen, the habits of which you so accurately describe, and am much interested in the instance which you report. Such instances have been placed upon record in several papers, but there has been so far no accurate scientific evidence of the power of this insect to inflict a fatal wound. For this reason I should be very glad to hear from you of the circumstances connected with this instance. In the first place, are you certain that the spider which bit the man belonged to this species (the scientific name of the spider is *Latrodectus mactans*, but it has no common name) ? (2) Was the spider *seen* to inflict the wound or was it found upon the wound immediately afterward ? (3) How long did the man survive the bite? (4) Was the wound a punctured one, and how large was the orifice? (5) What were the symptoms, aside from the spasms which you mention ; what was the character of the swelling? (6) Was the man healthy and strong, and what was his susceptibility with regard to other poisons, as the Poison Ivy, for instance? (7) At what time of the year did this occur, and what was the man doing when bitten ; was he in a profuse perspiration or not?

The answers to all these questions bear upon the interest attached to it, and you will greatly oblige me by answering them as fully and as accurately as possible. Our best arachnologists would deny the possibility of a fatal bite from these spiders were it not rendered uncertain by such positive accounts as these of yours. In view of this fact the importance of accurate investigation will be readily seen by you. We propose, as soon as opportunity offers, to experiment as to the poison of this and several allied spiders upon rabbits, and thus to approximate a solution of the question.

On receiving this letter, Colonel Keogh handed it to Mr. John M. Dick, who was the employer of the man in question, and whom Colonel Keogh states to be a "very intelligent and well-informed young farmer," who resides about half a mile from Greensborough. Mr. Dick's statement is as follows:

In reply to your questions, asked Colonel Keogh in your letter of January 11, I will make the following statements:

(1) No one was with the man when he was bitten. All we know is his own statement. He said he felt something crawling on his neck: as he brushed it off it stung or bit him very severely. As the pain was very great, he looked to see what had caused it. He described the insect as a black spider with a red spot on it.

(2) He was bitten about 8.30 o'clock a. m. and died between 10 and 11 o'clock p. m., about fourteen hours intervening.

(3) I examined his neck and found about ten little white pimples, all of which could be covered with a one-dollar silver coin. I saw no puncture of any kind.

(4) There was no swelling at all, but his neck and left breast and arm became very hard, so much so that I could not make an impression in the flesh with my thumb.

(5) The man had been living with me for nine years, and was perfectly healthy. Had no disease.

(6) He could handle poison *oak* or *ivy* with impunity.

(7) He was bitten on the 19th of October, 1887. He was hauling wood at the time. It was a damp cold morning and he could not have been overheated. As soon as the sensation of pain had passed off the man felt no further inconvenience till towards the middle of the day. (He described the pain from the sting as somewhat similar to the sting of a wasp.) About half past 11 o'clock he came to the house and told me that he had been bitten by a spider. I treated the matter lightly, thinking he would have been dead by that time if it was going to hurt him at all, but he complained of pains running through his whole body. Finally, he went to town (only 1 mile distant), saying he was going to get whisky. About 1 o'clock he came home. Said he felt no better. Said the pain had settled in his bowels. In a short while he commenced to have spasms. (He told me he had only bought 5 cents' worth of corn whisky.) When the spasm came on I was greatly frightened. As I knew of no remedy but whisky, I gave it to him. In all, I gave him three half pints. He seemed relieved of pain about 3 o'clock, and did some work about the barn. About 4 o'clock the pains came on again and the spasms with them. He had only two spasms. He never recovered from the second one, but remained in a state of unconsciousness till his death.

I have another man working for me who was bitten by one of the spiders about three years ago. I showed him the spider which Colonel Keogh forwarded to you, and he recognized it at once as being exactly like the one which had bitten him. As this man's experience with a spider bite is rather peculiar, I will give it to you as he has told me. He was at work in a corn field about the middle of June. It was the afternoon of the day. He went to a spring near by for a drink of water. While resting a moment at the spring the spider bit him on the ankle. He spit tobacco juice on the sting and soon felt no pain. (He describes the pain from the sting as more like a brier scratch.) He resumed the work, but in an hour or so felt a sudden shock or pain run through his whole body. As one shock would pass off another would come on. He unhitched his horse and attempted to ride home, but soon fell off the horse in an unconscious condition. His employer found him by the road side and had him taken home. This gentleman has since told me the negro seemed perfectly crazy. He told what had bitten him between spasms of pain. The only remedy he knew of was whisky. He gave the negro three pints, and it had no intoxicating effects. The negro had spasms one after another for several days. It was three weeks before he stopped having them, and it was two months before he was able to do any work. He has not entirely recovered yet. Whenever he becomes overheated he has to stop work. He has a numb sensation pass over him. His ankle did not swell at all. These same kind of pimples which I noticed on the neck of the man that died appeared on his ankle, and break out afresh every time he becomes overheated from exercise.

The spider—*Latrodectus mactans*—is congeneric with the well-known "Malmigniatte" of South Europe (*Latrodectus malmigniatus* Walck.), about the venomous nature of whose bite there is so much contradictory testimony.

It will be interesting in this connection to quote a few of the published opinions of naturalists upon this subject.

In the Annals of the Entomological Society of France for 1842, page 205, is a notice of different facts which confirm the venomous property of *Latrodectus malmigniatus*, by Dr. Graells, translated from the Spanish by Leon Fairmaire. He states in brief that prior to 1830, in the district of Tarragone (Department of Cologne), there was no knowledge of any spider which gave poisonous bites, but that in the years 1830, 1833,

and 1841 there were a number of such accidents. He shows that they occur most abundantly in the years of the migratory locusts and shows that such locusts were easily overcome by this spider. The Royal Academy of Medicine and Surgery at Barcelona in 1830 appointed a commission to investigate the dangerous accidents caused during the summer of that year by the spider. The members of the commission were not entomologists and their report was almost worthless. In 1833 there were a number of other cases and Dr. Graells was appointed by the Academy to investigate. He found as a matter of course that the reports were greatly exaggerated. A number of cases were found, however, and investigated, which were unquestionably caused by the bite of this spider, and the following symptoms were recorded:

A double puncture surrounded by two red circles, which unite, together forming an edematous areole which marks the seat of a tumor which develops later. The pain extends and soon occupies the length of the bitten limb, and often reaches to the axillary or inguinal glands, according to the limb bitten. These glands tumefy and become painful and the skin between them and the bite becomes marked with livid spots which seem to follow the course of the lymphatic vessels. The pain continues, reaching the body even to the abdominal and thoracic cavities, with a sensation of burning heat, strong constriction or soreness of throat, tension of the abdomen, tenesmus, and extreme headache, which makes itself felt along the spinal column; soon followed by general convulsions, more particularly in the extremities, followed often by insensibility, especially in the feet, which are ordinarily livid, while the whole body is swollen. This imposing array of symptoms brings about a very marked low spirit on the part of the patients, indicated by their expressions of despair, of profound affliction, or fear concerning the return of the health, for they believe themselves threatened with approaching death.

They continually change from place to place in their bed, giving utterance to sighs and plaintive cries, carrying their hands to their heads mechanically, or they say that they feel their brains pricked by pins. The face is sometimes red and burning, at others pale. The difficulty of respiration is marked, the pulse is very low, quick, irregular, the skin cold and rather moist from an abundant cold and viscid perspiration; at the same time the patient complains that his bowels are burning and asks for fresh water. In some cases the sight is almost totally obscured, the conjunctiva injected; in others the voice becomes weakened, and perhaps a ringing in the ears becomes very marked. Sometimes livid spots appear over the whole body. The intensity of these symptoms varies according to the susceptibility of the individual, to the strength of the Latrodectus, and also the number of bites which the patient has received.

Recovery comes sooner or later, according to the strength of the patient, the energy of the remedies, and the promptness of their effect. In all cases it is announced by the perspiration, which from cold and viscid becomes warm and vaporous; by the quickening and regularity of the pulse; by increasing facility in respiration and urination; by the cessation of the inflammation of the glands and of the aching in the brain and spinal cord, which passes into a sort of lethargy which may be more the effect of the laudanum given than a symptom of the disease.

Mr. Pierret, in the same periodical for 1843, page 8, states that this same spider inhabits Corsica also, and that its bites there cause symptoms similar to those described by Dr. Graells. It appears in the heat of summer and is found principally in houses. When an inhabitant is bitten the remedy consists in exposing the wounded part to strong heat from a furnace and in rubbing it with garlic.

On the same page Mr. Lucas announced that he had studied the habits of the same insect in Algeria, where it is frequently found. He states that he never observed that its bite was venomous and that he had himself been bitten several times without any bad effects.

Walckenaer, Histoire Naturelle des Insectes—Aptéres (Paris, 1837, p. 177 *et seq.*), makes the following statements:

However violent may be the effect of the venom which a spider injects into the puncture which it makes in the body of an insect which it seizes, this venom in the largest species in the north of France produces no effect upon man. I have allowed myself to be bitten by the largest species of spiders around Paris without consequent swelling or reddening. These small punctures have given me no other sensation than would have been produced by a pin or a needle which I had stuck into my finger. In fact, the venom of a spider has not even as great an effect upon man as that of a wasp, a bee, a bed-bug, a flea, and even still smaller insects. We see people not uncommonly who have probably been bitten by some one of these insects and who attribute the consequent results to the bite of the spider because it is often the first insect which they see when they find themselves awakened in the night by the pain. The spider, frightened by the unexpected approach of some person or by a light, runs to hide itself and thus has all the appearance of a culprit.

In warm climates, where very large spiders are found, the bite may be stronger and in consequence more painful, and, in time of extreme heat, with unhealthy persons, the slight inflammation which results from the bite may produce fever, and fever may bring about delirium without the action of any poison. It is thus that we explain the extraordinary effect attributed to the Tarantula de la Pouille and of the *Latrodectus malmigniatus* in the island of Corsica. The facts, from my point of view, have been greatly exaggerated; the observations upon which they are founded are all old, and even at the time when they made the most noise several judicious observers have treated them as fables. * * * [Here follows a short account of the Tarantula mentioned above.] They attribute to the *Latrodectus malmigniatus* of Sardinia the same effects as to the Tarantula. The species of this genus are, however, much smaller, but in America as in Europe they are considered venomous.

Azara has had several of his negroes bitten by the great *Mygale avicularia* of South America. He remarks that a fever of twenty hours' duration often results from these bites, and that it is sometimes accompanied by a little delirium, but that it never has serious results.

Again, in treating of the "Malmigniatte" under his specific description, Walckenaer says:

This species is believed to be very venomous. Its bite causes with man, so it is said, pains and even fever. Mr. Luigi Totti, physician of the Madeleine Hospital at Volterra, in a long memoir which he has sent to us, confirms all that has been said about the effects produced by this spider by Boccone, Keysler, Rossi, and others, although its mandibles are not very large and it is not large itself. Moreover, Mr. Abbot, who was ignorant of what had been written in Europe upon the genus, says of all three species which he has figured, that their bite is renowned in America; so the fact is certain. * * * Mr. A. Cauro, of Ajaccio, Doctor of Medicine, in a thesis entitled "Explanation of the methods of curing the bite of the *Theridion malmigniatte*, Paris, 1833," page 6, says: "It appears that the venomous character of *Theridion malmigniatte* is not settled, because all naturalists avoid saying that they believe that its bite is very dangerous. It is certain, very certain, that it is very dangerous in Corsica; perhaps it may be fatal under some conditions." Mr. Cauro gives in detail the effects of this bite, which resemble, he says, those of the bite of the viper; but Mr. Cauro, as well as

all his predecessors, has not taken care to assure himself that the sickness that he describes was actually caused by the Latrodectus. He reports no observations—no experience which proves it.

The following paragraphs are taken from an article by Rev. J. Blackwall, in the Transactions of the Linnæan Society of London (Vol. XXI, 1855, p. 31) entitled "Experiments and observations on the poison of animals of the order of Araneidea:"

The numerous accounts which have been published by various authors of the singular effects induced in the human species by the bite of the Tarantula (*Lycosa tarantula apuliæ* Walck.), and of the still more extraordinary mode of cure, together with the serious and sometimes fatal consequences which have been attributed to the bite of the Malmiguiatte (*Latrodectus malmigniatus* Walck.), must be regarded as amusing fictions in the natural history of the Araneidae, * * *."

The legitimate conclusion deducible from the experiments seems to be, that there is nothing to apprehend from the bite of the most powerful British spiders, even when inflicted at a moment of extreme irritation and in hot sultry weather, the pain occasioned by it being little, if any, more than is due to the laceration and compression the injured part has sustained.

These experiments do not present any facts which appear to sanction the opinion that insects are deprived of life with much greater celerity when pierced by the fangs of spiders than when lacerated mechanically to an equal extent by other means, regard being had in both cases to the vitality of the part injured, as the speed with which existence terminates mainly depends upon that circumstance. It is true that the catastrophe is greatly accelerated if spiders maintain a protracted hold of their victims, but this result is obviously attributable to the extraction of their fluids, which are transformed by oft-repeated acts of deglutition into the stomachs of their adversaries.

From the entire mass of evidence supplied by the experiments taken in the aggregate, it may be fairly inferred that whatever properties characterize the fluid emitted from the orifice in the fangs of the Araneidæ it does not possess that degree of virulence which is commonly ascribed to it, neither is it so destructive to animal life when transmitted into a recent wound as it is generally supposed to be. Were I disposed to speculate upon the manner in which it affects insects on being introduced by the fangs into their vascular system, I might conjecture that it has a tendency to paralyze their organs of voluntary motion, and to induce a determination of their fluids to the part injured; but I refrain from dwelling upon a suggestion, however plausible it may appear to be, which in the present state of our knowledge of the subject can only be regarded as hypothetical.

The so-called "Katipo" of New Zealand is a poisonous spider, which apparently belongs to the genus Latrodectus, and from the descriptions which we have seen much resembles the North American *L. mactans*. It is referred to by Mr. Taylor in his work "A leaf of the natural history of New Zealand" as "the Katipo—venomous spider—one kind red, and one black with a marked red spot on its back. Their bite appears to be very poisonous, occasioning a violent swelling of the part." Other writers state that Mr. Taylor is mistaken in describing a red Katipo, but agree with him that the one with the black body and red vermilion spot on its back is the most poisonous.

Mr. F. W. Wright, in an article published in the Transactions of the New Zealand Institute for 1869, states that the spider is from one-half to three-fourths of an inch in diameter, measuring across the body and

legs, and that there are two varieties, one of a dark glossy brown or black color, and the other similar, except for a red spot upon the abdomen. Of the immaculate variety he says:

The abdomen is perfectly spherical, like a No. 1 shot, and very glossy; the legs are compact, not straggling. It is found among dead wood in the garden, with a slight web; amongst the rafters of an out-building. The natives have no distinguishing name for either variety; they are both called "Katipo," to distinguish them from the "Punga-were-were," the common spider.

Mr. Wright gives a number of cases, from hearsay, of fatal bites by the red-spotted variety, and describes a serious case in his own practice, which, however, did not result in death. Mr. Wright, in all of the cases which he mentions, seems to have considered that the simple word of the patient that he was bitten by this spider is sufficient. He evidently has no doubt that it was the spider which produced the result. The circumstances of the case which came under his own notice are worth quoting in full:

In the month of December, 1868, a person of the name of John Huff, living near my residence, came into the surgery complaining that he had been bitten on the shoulder by a spider. He was in the employment of Messrs. Archard & Brown, of Stanley Street, Mechanics' Bay. He was occupied at the time in carrying fire-wood to supply the furnaces of a brick-kiln; the wood was stacked near the kiln in sedge or coarse grass; this happened between the hours of 11 and 12 o'clock a.m. At noon he came home to dinner, sat down to table, but upon attempting to eat found he could not open his mouth, or was scarcely able to articulate, in consequence of stiffness about the jaws. He was alarmed, and came into the surgery, when it was difficult to understand what he had to say. All I could learn from him was that he had been bitten by a spider on the shoulder, in the bay. Upon examining the spot, I found the surface raised to an extent as large round as a tea-cup; this elevated surface was white, and was surrounded by a halo of red, not unlike an exaggerated wheal of the nettle-rash. He complained of considerable pain in the part, and during the examination became faint, and soon almost pulseless. His pulse was unusually slow, scarcely counting more than twelve or fourteen beats in the minute. His countenance and the general surface of the body assumed a hue of extreme pallor, which gradually turned to a blue tint. His extremities were cold and flaccid; his respiration almost ceased; and indeed I had fears that he was about to expire. Dr. Pinching being in my house at the time, I called for his assistance. He was astonished at the feebleness and prostration of the patient from such an apparently trifling cause.

From his extreme faintness it was necessary to lay him on the floor, when I applied spirits of ammonia to the wound, which had the effect of lessening the swelling and abating the pain. I also administered ammonia and water, afterwards combined with brandy, in considerable doses; under this treatment his pulse gradually improved, his circulation and respiration became more natural, as was evidenced by his return to a more natural color. Although a stout, strong man, this state of depression remained for upwards of two hours before he was able to return home. In the evening I found him considerably improved, having taken a slight dose of medicine. For several days he could not return to his work, but complained of great lassitude and nervous depression, which he was sensible of for many days after.

It must be evident, from the symptoms of this case, that the man was powerfully affected by a narcotic and irritating poison, which, being absorbed into circulation, affected the heart, brain, and nervous system to a very considerable extent, almost amounting to fatal syncope; that the stimulants, by exciting the heart's action, gradu-

ally aroused the excretory functions, so as ultimately to remove the poison from the system; for although suffering under its influence for a considerable time, it does not appear to have left any permanent effects behind it, for the man has since been in perfect health.

Mr. Wright further states that the Maoris are well acquainted with these spiders, and have always considered their bite very dangerous. The tufts of sedge upon the sea-beach are the favorite haunts of the red-spotted variety, and the natives avoid sleeping in such places. Half a stone's throw inland, however, they do not fear the Katipo. The native remedy consists in rubbing the part and applying hot half-scalded leaves. Formerly the priests were consulted and incantations to the gods of the hills and valleys were supposed to be efficacious.

It will possibly appear to the reader that after collecting this testimony we are as far from the solution of the question, "Do spider bites ever produce fatal results?" as we were before; but it seems to us, after analyzing the evidence, that it must at least be admitted that certain spiders of the genus Latrodectus have the power to inflict poisonous bites, which may (probably exceptionally and depending upon exceptional conditions) bring about the death of a human being. Admitting in its fullest force the argument that in reported cases the spider has seldom if ever been seen by a reliable observer to inflict the wound, we consider that the fact that species of Latrodectus occurring in such widely distant localities as South Europe, the Southern United States, and New Zealand are uniformly set aside by the natives as poisonous species, when there is nothing especially dangerous in their appearance, is the strongest argument for believing that these statements have some verification in fact. It is no wonder that a popular fear should follow the ferocious-looking spiders of the family Theraphosoidæ; but considering the comparatively small size and modest coloring of the species of Latrodectus so wide-spread a prejudice, occurring in so many distinct localities, must be well founded.

As no good figure of our *Latrodectus mactans* has been published, we have had Dr. Marx prepare the accompanying illustrations. The large female was drawn from specimens collected by Mr. Townsend, near New Orleans, La., and the variations were drawn from specimens in Dr. Marx's own collection.

DESCRIPTION OF LEONIA RILEYI, A NEW MELOÏD GENUS NEAR HORNIA.

By Dr. Eugène Dugès, *Guanajuato, Mexico.*

Length, 11^{mm}; diameter, 3^{mm}. Of a more or less dark ferruginous color and covered with stiff hair or black setæ.

Labrum somewhat retracted, anteriorly depressed and slightly emarginate, laterally nearly rounded, punctate, hairy, ferruginous; mandibles conical, stout, curved, apparently broken at tip, which is obtuse with traces of a rupture: maxillæ with two corneous lobes, the external one at tip of the shape of a rounded plate and ciliate,

the internal one sub-quadrate at tip, provided with thick and stiff hairs; maxillary palpi, four-jointed, the last ovoid, much less large than in Hornia. Mentum trapezoidal, *i. e.*, quadrate with the front margin shorter than the posterior; ligula coriaceous, rounded at tip; labial palpi, three-jointed, the last ovoid and of the same form as the corresponding joint of the maxillary palpi; antennæ inserted on an elevation of the front, ten-jointed, first joint the longest and thickest, claviform, second one-half the size of the first, transverse-conical, third conical, thinner, and longer than the second, fourth three-fourths the size of the third, fifth to ninth similar to the fourth, tenth oval, longer than the ninth; joints 5 and 6, 7 and 8 have the tendency to become connate into a single joint. The antennæ are stout and resemble much those of the male Hornia. They are longer than the head, punctulate and pubescent. The first two joints are ferruginous, the remaining black; epistoma separated from the front by a short, well-marked, and anteriorly straight furrow, punctulate, ciliate, ferruginous; eyes small, decidedly transverse; head trapezoidal, a little wider than the thorax, posterior margin straight, angles rounded, surface strongly depressed, with sparse black pubescence; color ferruginous.

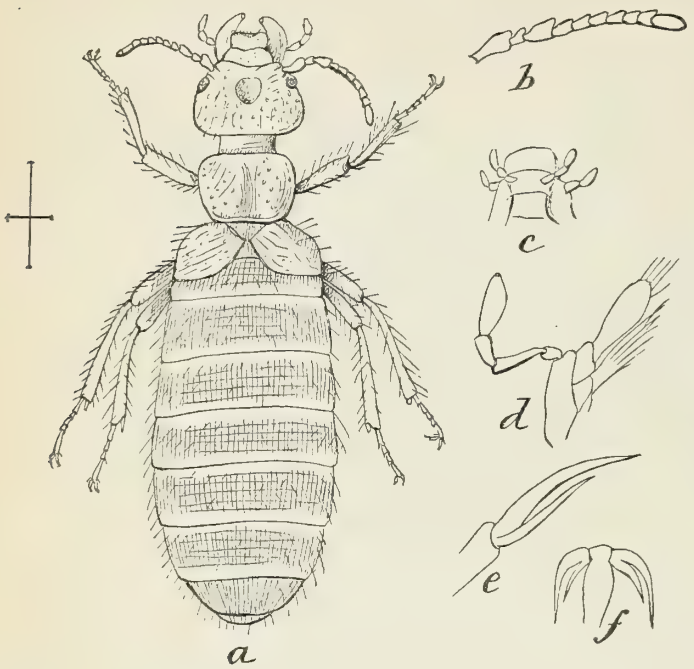


Fig. 47.—*Leonia rileyi*: *a*, adult female; *b*, antenna; *c*, labium; *d*, maxilla and palpus; *e*, tarsal claw from the side—enlarged; *f*, tarsal claw from above, still more enlarged (from drawings by Dugès).

Prothorax strongly transverse, one-third wider than long, a little narrowing posteriorly, side margin straight or nearly so, anterior angles strongly rounded, posterior angles less so, base slightly margined and sinuate; dorsal channel obsolete, surface shining, punctate, ferruginous, covered with black hairs.

Scutellum large, slightly transverse-triangular, rounded at tip, punctate, black.

Elytra squamiform, but larger than in Hornia, for they nearly reach the middle of the first abdominal segment. They meet at the tip of the scutellum with their internal humeral (sutural) angles, but diverge thence so that a small portion of the metanotum becomes visible; rounded at the side and subangulated at the internal margin; the angle which is here visible may be said to be the internal apical angle. Surface coriaceous, rugose, punctate, testaceous, covered with black hair. It is hardly necessary to state that the elytra do not cover the side pieces of the sternum. No underwings. Metasternum very short.

Abdomen normal, *i. e.*, very little inflated and in no way baggy (*en besace*); all segments entirely subcorneous, though less so on the ventral side than dorsally. Last dorsal segment very small, rounded at tip, last ventral a little larger and emarginate. All segments blackish-brown with anterior and posterior borders ferruginous, excepting the two last segments which are entirely black. The whole abdomen is shining and pubescent.

Legs ferruginous, covered with black hair. All coxæ conical and very prominent, the intermediate impending on the posterior, just as in Hornia, although the overlapping is here more marked. Femora slender without silky emargination; tibiæ slender, also without emargination and with well developed spurs, those of the hind tibiæ large and rounded at tip. Tarsal joints slender. Claws reddish, long, curved, and acute, on the underside provided with a long, straight, acute spine, attaining three-

fourths the length of the claw and which represents, in our opinion, the lower division of the claw in the other Meloidæ. This spine is longer and thicker than in Hornia, where it is but little visible, and hardly one-fourth the length of the upper division. Otherwise the claws of Leonia entirely resemble those of *Sitaris muralis* and Hornia.

The insect just described is closely allied to Hornia. Still we believe it deserves to form a separate genus which should enter the tribe proposed by us in our "Synopsis des genres de Méloides du Mexique" (Bull. de la Soc. Zool. de France, ix, 1886, p. 1) between the "Méloides vrais" and the "Cantharides" of Lacordaire (*Meloini* and *Cantharini* of Le Conte and Horn) for the genus Hornia. This tribe could be called *Hornii* (*Horniides*) if this new division should be adopted, which would thus comprise already two genera, Hornia and Leonia.

The important characters of this Meloïd are: the overlapping of the posterior coxæ by the intermediate ones, the very short metasternum, and the side pieces of the sternum not being covered by the elytra. These characters approach it to Hornia, from which genus it differs in the number of antennal joints, which is certainly only 10 in our specimen (possibly a sexual character, but if so, we should say not a less remarkable one); further in the form of the prothorax, which is by no means elongate or campanulate but rather cordate; in the much larger elytra, the metasternum being much less visible; in the abdomen being not much inflated and sub-corneous in all its parts; and finally in having that long spine which represents the lower division of the claws. It approaches the *Sitarini* in the form of the elytra and claws, but the characters just mentioned remove it so decidedly that in our opinion it can not be associated with that tribe.

We have so far seen only two specimens of *Leonia rileyi*. One is that we have just described; the other was sent by us to Europe to Mons. Auguste Sallé. We have found them on the walls of a dwelling-house of the Hacienda de Jupátaro, State of Guanajuato, Mexico. At that place we also observed some probably undescribed Anthophoras, from the nests of which the beetles probably had emerged.

I have dedicated this new genus as a mark of friendship and esteem to my friend, Dr. Nicolas Leon, Director of the Mechoacano Museum of the city of Morella, capital of the State of Mechoacan, Mexico, a scientist already well known whether in Mexico or in Europe and the United States, as a bibliophile, antiquarian, and naturalist. In regard to the name of the species, I have given it that of *rileyi*, in honor of Dr. C. V. Riley, the learned American who first drew our attention to the remarkable peculiarities of this insect (which in our Synopsis we had placed, with some reserve, in the *Sitarini* under the name of *Hornia mexicana*) and who was kind enough to send us a pair of *Hornia minutipennis* Riley, which served us for comparsion.

ON THE EMASCULATING BOT-FLY.

(*Cuterebra emasculator* Fitch.)

Since the publication by Dr. Fitch in his Fourth New York Report of his long and interesting account of this insect, it has received little notice from entomologists. Dr. Fitch's article attracted great attention, and the fact that a bot-fly existed which, according to his statements, apparently bred only in the testicles of Chipmunks or Gophers and Squirrels was certainly a remarkable one. Dr. Fitch succeeded in rearing but one adult which issued about July 29, 1857, from earth in a jar in which the larva had been placed September 1, 1856. So far as we know this is the only adult of the species which has ever been reared.

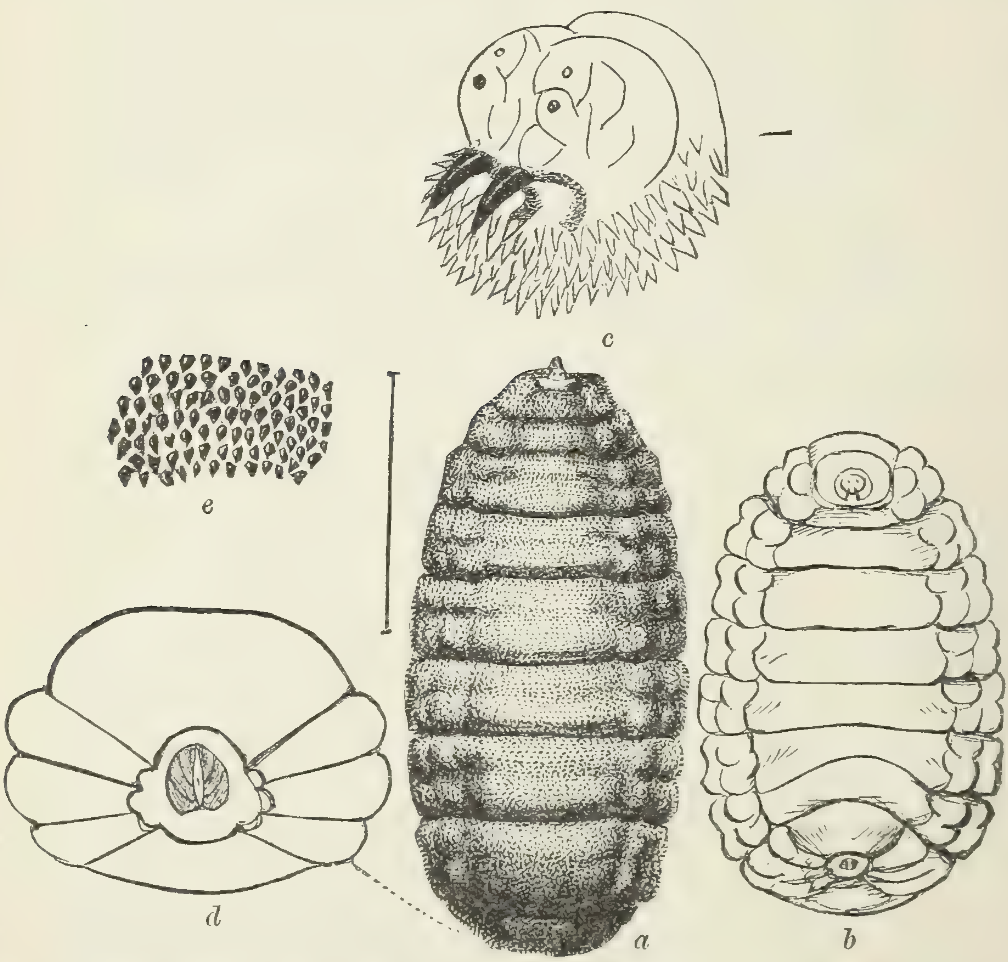


FIG. 48.—*Cuterebra emasculator: a*, full-grown larva from above; *b*, same, from below—enlarged; *c*, head of same; *d*, anal end of same; *e*, portion of integument of same—still more enlarged (original).

Dr. Fitch published a painstaking description of the different stages and gave the species the name of *Cuterebra emasculator* from the larval habit which he supposed characteristic. He mentions the fact that hunters in the vicinity of Lakeville, N. Y., where the first specimen sent him was found, had long been familiar with the fact that at least one-half of the male gray squirrels shot in that vicinity were found to be castrated, and that it was the opinion of hunters that the deformity

was caused by the squirrels seizing and biting out the testicles of their comrades. In support of this idea he gives the testimony of Mr. Hurst, taxidermist of the New York State Cabinet of Natural History, who claimed to have seen a half dozen red squirrels unite in mastering a gray one and castrating him. Dr. Fitch queries whether the bot-fly may not be attracted by the wound so made, if this habit prove common, but concludes that the object of the joint attack of several upon one is rather to kill the grub which is engaged in emasculating him.

Unfortunately there is yet some doubt as to whether Fitch's species will hold. Brauer, in his Monograph of the Œstridæ, page 232, quotes Fitch's description at length, and states that he can not separate the species from *Cuterebra scutellaris* Löw, a North American species, the habits of which do not seem to be known.

If this interesting insect has not attracted much attention of late years from entomologists, it has not failed to be noticed by zoologists and taxidermists, although we are not aware that observations have been published. The following statement was written at our request by Dr. Merriam, the Ornithologist of the Department, as we had learned by conversation that he had made notes some years ago on the abundance of the insect in New York State:

In reply to your inquiry concerning the occurrence of Cuterebræ in squirrels, I would state that during many years collecting in the Adirondack region of northern New York, particularly along its western border, in the Black River Valley, I frequently found Cuterebræ in or near the scrotum in the Gray Squirrel (*Sciurus carolinensis leucotis*), Red Squirrel (*Sciurus hudsonius*), and Chipmunk (*Tamias striatus lysteri*). I have observed the same thing at East Hampton, Mass., and in other localities. The most extraordinary instance of the prevalence of this disgusting parasite that has fallen under my observation was at the south end of Lake Champlain, New York, in October, 1885. On the 7th and 9th of that month I killed more than fifty Chipmunks (*Tamias striatus lysteri*) within a few miles of old Fort Ticonderoga and on the rocky side hill behind the town of Whitehall. Of these a very large percentage—I think fully one-half—were infested with "wabbles" (Cuterebræ). More females than males were thus afflicted. The "wabbles" were usually situated near the median line, and anywhere from the umbilical region to the genitals. In a few cases they were in the axilla, and in one or two instances in the upper part of the foreleg. In a number of individuals two Cuterebræ were found and in a few cases as many as three.

Dr. A. K. Fisher tells me that he collected a number of Chipmunks about the south end of Lake George, Warren County, N. Y., during the latter part of August and first of September, 1882, a considerable proportion of which were infested with Cuterebræ. As many as three were found, in different stages of development, in one animal. A Gray Squirrel killed at Sing Sing, Westchester County, N. Y., contained a Cuterebra in the left pectoral region.

Respectfully,

C. HART MERRIAM,
Ornithologist.

It is very possible that the larvæ of more than one species of the genus Cuterebra were concerned in the cases noticed by Drs. Merriam and Fisher, but this point can not be decided at the present time.

The chief object, however, of publishing this note is to introduce careful figures of the full-grown larva not before published. They are drawn from a specimen received through the kindness of Mr. George B. Starkweather, of this city. Concerning the capture of the specimen, which was from a female Chipmunk, Mr. Starkweather wrote, October 19, 1888:

About noon on the 13th my children's pet kitten came in from the grove near our house, in the Rock Creek region, with a " chippy " in its mouth. They rescued it at once, but, although warm, life was extinct. The strange appendage, or abnormal growth which they noticed on the under side, caused them to lay it away carefully in an empty covered cigar-box " to show to papa."

My attention was called to it twenty-four hours later, when the dark-colored maggot was found in one corner of the box nearly motionless. They described the "swelling" as about an inch long and of the shape of a mulberry. There seemed to be a natural opening at its apex over a sixteenth of an inch in diameter with a tinge of a dark liquid about it.

Subsequent inquiry has revealed the fact that squirrel hunters in this vicinity report that these grubs are very abundant around Washington in the common Gray Squirrel, one gentleman, with that freedom from fact-bias characteristic of the amateur hunter, stating that he never shot a squirrel which was not infested by grubs. We will doubtless, therefore, have opportunities for rearing the adult and comparing it with Löw's *scutellaris*.

The larva has already been well described by Fitch, and our figures will illustrate its appearance. The specimen from which they were drawn was evidently full-grown, and has entered the earth in a breeding jar.

EXTRACTS FROM CORRESPONDENCE.

Injurious Insects in Mississippi for 1888.

(1) The Cotton Worm (*Aletia xylina*) was reported from the Homochitto River and Middle Fork Creek bottom after the storm of the 19th and 20th of August, but without doing any serious damage. Winds mostly southeast and east. On September 10 I observed them of three different sizes in my own field, feeding on the second growth of tender cotton leaves. I have noticed on some stalks worms as marked (*2a*) on Plate I, Report IV, United States Entomological Commission, eating on the under side of the leaves, others as marked on same plate (*2d* and *2h* as well as *2f*). They continued to eat slowly and made but very little progress in destroying the foliage. Cool nights and hot days kept them at bay during the latter part of September and the first part of October. As some of the most natural enemies of the Cotton Worm observed during this season I will mention one spider (*Oxyopes viridans*); one wasp (*Polistes bellicosa*); one bug (*Metapodius femoratus*); one fly (*Proctacanthus milberti*); one orthopter (*Mantis carolina*). All those mentioned above I have observed myself destroying the worms. The latter did not damage the cotton crop to any extent in this county. During the middle of October they webbed up in all parts of the field, and I observed a large number of Cotton Worm chrysalids destroyed by the larvæ of *Chauliognathus americanus*. I also found some chrysalids devoured by the larvæ of *Cyrtoneura stabulans*, and have likewise found some empty skins of chrysalids containing the puparium of this fly.

(2) The Boll or Corn Worms (*Heliothis armigera*) were very numerous on late corn, and I have found from two to five worms of different sizes in most every ear of corn examined. They likewise damaged the cotton crop to some extent.

(3) The Sugar-cane Beetle (*Ligyrus rugiceps*) has been reported as doing considerable damage to sugar-cane during the early part of the spring.

(4) The Greasy Cut-worm (*Agrotis ypsilon*) was reported from all parts of this county to be very destructive in cotton fields, cutting the plants, and thereby seriously injuring the stand of cotton.

(5) The Cabbage Plant-louse (*Aphis brassicæ*) has been very numerous this past season, seriously injuring the cabbage crop.

(6) The Wavy-striped Flea-beetle (*Phyllotreta vittata*) has been during the past year a great garden pest, and destroyed turnip and mustard plants especially.

(7) The Southern Cabbage-butterfly (*Pieris protodice*) has been, in the larva state, exceedingly injurious to the cabbage family. I noticed some of the butterflies on the 6th of November in our gardens.

(8) I also wish to mention a beetle, the Twig Girdler (*Oncideres cingulatus*) which has been very destructive to hickory and persimmon twigs in this county. I have found them gnawing grooves around the twigs of large rose-bushes in my yard, severing the limb sufficiently to make it fall to the ground by the first slight wind.

(9) The Apple-tree Tent-caterpiller, as described on page 412 of the Annual Report of your Department for 1884, did serious damage to the plum and apple trees in this locality.—[George H. Kent, Roxie, Miss., December 1, 1888.

Larva of Hyperchiria io on Saw Palmetto in Florida.

I send you a very beautiful caterpillar by this mail. I hope it will not be a chrysalis when it reaches you. It preys only on the Saw Palmetto so far as I have observed and does not damage that to any extent. I should be glad to get its name from you. —[Robert Ranson, Canaveral, Fla., December 3, 1888.

Reply.—I beg to acknowledge the receipt of yours of the 3rd instant and the accompanying caterpillar found feeding upon the Saw Palmetto. This caterpillar is the larva of the common Io Moth, *Saturnia io*, so called on account of the large eye-spots on the hind wings. The caterpillar is a very handsome one, but has the disagreeable property of producing a nettling effect upon the skin when handled. It spins its cocoon at or just under the surface of the ground, and passes the winter in the pupa state and the moth emerges in the spring. This insect is so far from being confined to the Saw Palmetto that this is the first time it has been reported from this plant, so far as we know. It is found upon the greatest variety of plants, and is common from New York to Florida. It is seldom or never reported as appearing in sufficient numbers to be called injurious. * * * —[December 7, 1888.]

Acanthacara similis injuring Pineapple in Florida.

I am forwarding to you by this mail an insect that I have recently found eating the leaves of Pineapple plants. I shall feel greatly obliged if you will kindly let me know what it is and something of its habits.—[A. Haden, Orlando, Fla., December 2, 1888.

Reply.—Your letter of the 2d instant and the box containing an insect found upon the Pineapple plant have been duly received. The insect is one of our large katydids, but has no common name. Its scientific name is *Acanthacara similis*. But little is known concerning the habits of this insect except that it is a leaf-feeder throughout its whole existence. The manner and place of depositing the eggs is not known. Your Pineapples can doubtless be protected by spraying with a dilute solution of Paris green or London purple. Will you kindly inform us as to the numbers in which this insect appears and the damage it does.—[December 7, 1888.]

SECOND LETTER.—I have to thank you for your communication dated 7th instant, with particulars regarding the insect I forwarded (*Acanthacara similis*). It is only within the last month or two that I have noticed the appearance of this insect on my Pineapple plants, and the damage done so far has been trifling, as I have only succeeded in finding two specimens actually on the plants. The green outer surface and edges of the leaves attacked are eaten, leaving the white fiber exposed, and causing the leaf above the part eaten to wither and die.—[December 15, 1888.

Hylesinus trifolii in Ohio.

Your favor of the 30th ult. received. I am not fortunate enough to be the possessor of the volume you mention, viz: Report of 1878. I have the reports of 1877 and 1879, but neither mentions the Clover Root-borer, so I have had no way of identifying the beetle except from reports and descriptions given in the *Ohio Farmer* and other agricultural papers. But, from all I can learn from the above sources, I am confident that it is *Hylesinus trifolii*. However, to be certain, I went to my field December 5 and obtained specimens, imago and pupa, which I inclose. * * * The tap root of the clover was in every case eaten hollow, and the borers were hibernating in the crevices quite close to the surface of the ground. The past season was the second that the field has been mowed. * * * —[W. B. Hall, Wakeman, Ohio, December 7, 1888.

REPLY.—Your letter of the 7th instant, accompanying specimens, came safely. You are right in your identification of the Clover Root-borer as *Hylesinus trifolii*. This insect has spread greatly in the last few years, and no satisfactory remedy has been suggested beyond plowing under the clover in the spring of the second year and planting some other crop. * * * —[December 11, 1888.]

Wisconsin Letter on Cicada septendecim.

* * * There are many strange stories told about them [the Cicadas] and not a few egregious mistakes written about them by authors, some claiming that the male never eats anything during its existence as a perfect insect. * * * They derive their nourishment from vegetable substances. Soft maples seem to be a favorite tree for them to feed upon. I have seen trees several inches in diameter covered with them, their probosces driven into the bark almost their full length, and I could see no difference between male and female; they seemed to feed alike, but I have never seen them thus engaged until about the middle of the afternoon. Their excretion is a clear transparent fluid. * * * The season was an uncommonly growing one; vast numbers of the eggs were grown in and over by the rapid growth. The vast amount of dead leaves seen on the trees was caused by the puncturing of small twigs, and larger ones on both sides. The heavy foliage, when violently moved by strong winds, broke the weakened limbs and but few eggs matured in the broken twigs. I have noticed in blackberry twigs that the newly hatched insects in some cases worked their way into the soft pith when egress was prevented. Among their enemies are hogs, some of which were reported to me as having died from eating too many of them before they took wing. Poultry, birds, and especially crows are destructive to them. One insect that seems to have escaped notice as an enemy is the Soldier Bug. It inserts its long bill into the puncture of the twig and eats the eggs.—[John March, Shullsbury, Wis., December, 1888.

A Proposed Remedy for the Chinch Bug.

Several years ago I had a small rye field intended for green feed, and on one side of said rye field there was Indian corn and on the other there was what we call Texas

sugar-cane, used for green feed also (it sprouts out again as often as it is cut until killed by frost). As the rye was getting ripe, so that the numerous Chinch Bugs could not find any more nourishment in the same, they turned into the adjacent corn field, and on the other side into said Texas sugar-cane. They were in such numbers that they would soon have killed off both crops.

I now set in and tried insect-powder, coal-oil, and other insecticides on them, and being convinced that no poison could affect them, since the whole bug family suck their meals through a bill, I came to the conclusion to kill them with hot water. Since the crops would be killed by the insects anyway, a trial would not hurt, but at the same time I anticipated that neither the corn nor the cane would be hurt by the hot water christening, from the fact that the stems of these plants are enveloped in so many leaves that the insects would surely all be killed before the heat reached the tender parts. So I poured boiling-hot water upon the lower parts of the corn infested with the Chinch Bug, which were black with them, and killed them outright, and with a garden sprinkling-can killed them in the same way on the Texas cane. The result was that the corn and cane were both saved. The corn did not suffer any by the process, and the cane had only some of its outer leaves burned, and grew on all summer. Next year I recommended the same process to some friends who expected to lose their corn by Chinch Bugs. They set out kettles in the fields and saved their corn in the same way, and informed me that the hot water only made the corn grow so much faster, and did not hurt it in the least. I tried steam afterwards, and found it to be as good as, if not better than, hot water. A narrow gauged steam-boiler might be used therefor with the proper pipes and hose, and jets let on the corn-stalks when passing through the rows, and the bugs killed in this way without injuring the corn in the least.

As the Chinch Bug migrates from the wheat or rye fields into the corn or cane, my advice is not to let them come into the latter, but kill them in the stubble or even before the wheat or rye is cut; the farmer might run his boiler along the wheat or rye fields adjacent to a corn or cane field and let jets of steam into the former, killing the insects before they commence to migrate, and as soon as the wheat or rye is cut set your boiler at work, and with proper hose or perforated pipes run over your whole wheat and rye stubble, killing every Chinch Bug on your stubble and at the same time all the young Grasshoppers, which are then just emerged from their eggs to commence their depredations. Steam may exterminate not only Chinch-bugs, but also Army Worms and Cabbage worms. If it is an established fact that Chinch Bugs can be killed by steam on the stubble of each farmer, why not pass laws that each farmer is responsible for the damage of his Chinch Bugs to his neighbors? If a meadow is infested with the Army Worms, our present plan is to make ditches around the infested field and prevent them from marching further, which forces them to turn into chrysalids on the field where they started from, and set loose the millers or butterflies again upon the world, to lay new eggs of destruction for the next year. But if my plan of using steam-boilers on wheels for the destruction of insects were introduced it would be an easy matter to run such a steaming machine over any meadow infested with Army Worms and kill them outright. In like manner a light steamer with perforated pipes set high horizontally might be used to kill the caterpillars on cabbage, since the latter can stand a much greater heat than the caterpillars can. Surely in parts of our country where the Grasshoppers do great injury they might be killed by steam when young.—[George C. Bunsen, West Belleville, Ill., November 8, 1888.

Reply.—* * * The use of hot water against these insects is very old. You will find it referred to in my Reports on the Insects of Missouri, and briefly mentioned in the Annual Report of this Department for 1887, page 80. Your proposed application of steam by means of narrow-gauge steam-boiler is simply a modification of the old

idea without the indorsement of practical experience. It looks rather well on paper. but is inferior in many respects to the use of a good kerosene emulsion as recommended in the same report.—[November 13, 1888.]

Introduction of Icerya Parasites in California.

I am very glad you consider the identity of the parasite (Lestophonus) found on Monophlœbus and Icerya proved beyond a doubt. The last experiment of sending Monophlœbus on ice proved a success, inasmuch as the majority of flies hatched under the cage in San Mateo, but so far I can see no trace of their progeny. I examined the bush carefully the other day; it appears to me that there are many Icerya that look unhealthy compared with those on surrounding trees.—[W. G. Klee, San Francisco, Cal., November 11, 1888.

Two Species of Anomala injurious to the Vine in the South.

To-day I mail you specimens of two species of beetles from Louisiana, sent me to tell what they are. They are new to me, though the smaller somewhat resembles the Grapevine Flea-beetle. Both are very ravenous feeders upon the leaves of the grape, completely skeletonizing them when the beetles are numerous. They also eat out young buds and tips of shoots. They come in June and July in Louisiana. When disturbed they drop to the ground and the larger feign death for some time, while the smaller at once seek cover, which also do the larger after "possuming" awhile. * * * They promise to be very destructive to vineyards if they should become numerous.—[T. V. Munson, Denison, Tex., January 24, 1887, to Mr. H. E. Van Deman.

REPLY.—Yours of the 24th instant has been referred to me by Mr. Van Deman. The insects which accompany your letter and which you state are eating up your grape leaves and buds belong to two species of a genus of leaf-eating beetles, Anomala. The larger one is *A. marginata*, and the smaller one, *A. minuta*. So far as I know these insects have never been specifically complained of as grape-vine pests, although when very abundant I have no reason to doubt their power for considerable damage. I would advise as a remedy spraying the vines with the ordinary Paris green or London purple solutions at any time before your grapes begin to ripen.—[January 31, 1887.]

Beetles boring in an Opium Pipe from China.

I send you per to-day's mail a vial containing three minute beetles, with their frass or débris. An opium pipe, a curiosity from China, made of bamboo, suddenly proved to be infested with these insects, and it is, in fact, honeycombed with them, for shaking the pipe would give a tablespoonful of the frass, with a number of the insects. I send you three, which are all the live ones I could get.—[S. Lockwood, Freehold, N. J., March 8, 1887.

REPLY.—I beg to acknowledge the receipt of yours of the 8th instant and of the accompanying package containing beetles reared from the bamboo opium pipe. These beetles belong to the genus Dinoderus and are allied to *D. floridanum* Horn, but of course it is a difficult thing to determine specifically the small Chinese insects. I would call your attention to the article by Dr. Hagen in the *Canadian Entomologist* for August, 1886, in which he mentions two Ptinid beetles bred from a bamboo box from Hong Kong.—[March 10, 1887.]

A Grape-vine Flea-beetle in the Southwest.

Inclosed please find specimen of a bug which made its appearance in this valley (Salt River Valley) within the last eight days. It preys chiefly upon the tender leaves of the grape, as you see per sample. This being our first experience here with grape

pests, and the insect being a stranger to us, I inclose these samples for such information as you may be able to give us in the premises, as there is much uneasiness concerning the future crop.—[J. J. Wingar, Tempe, Ariz., April 13, 1886.

REPLY.— * * * The insect damaging your grape-vine is one of the Jumping Flea-beetles and is known as *Graptodera ignita*. It is a close relative to the Steel-blue Flea-beetle of the East (*G. chalybea*), which also injures grape-vines in this way. On a small place it is the custom here to kill the beetles by jarring them on sheets saturated with kerosene, as in the early spring they do not readily take to flight. In the large vineyards the best plan would be to spray the vines with a dilute solution of Paris green.—[April 21, 1886.]

The "Voice" of Vanessa antiopa.

* * * *Vanessa antiopa* has a "voice" similar to *Acherontia atropos*, but evidently not so strong, much finer, but still remarkably loud for its body, proboscis, and for a day-butterfly. I heard it in Europe, in Lorraine, from two Antiopas on a beech-stem walking around each other, and agitating their wings with often-repeated cries, evidently preparing for copulation.

I wrote of it to Dr. Eimer at Tuebingen, but he wanted some larvæ of the Antiopa to study the thing, and I could not find him any, as they are scarce in Lorraine.—[Ch. Wercklé, Ocean Springs, Miss., September 6, 1886.

REPLY.—* * * Your observation concerning the "voice" of *Vanessa antiopa* is new to me, although it may have been noticed before.—[September 10, 1886.]

A Swarming of the Milk-weed Butterfly in 1886.

The following is a brief account of a migratory movement of enormous numbers of the common so called Milk-weed Butterfly observed at West River, Maryland, on the 23d of September, 1886. About 7 o'clock in the morning my son, G. Murray Ellzey, called the attention of myself and several other gentlemen to the fact that "the whole heavens were swarming with butterflies." There were an innumerable multitude of them at all heights from, say, 100 feet to a height beyond the range of vision, except by the aid of a glass. They were flying due southwest in the face of a stiff breeze. Observations upon the flight of individuals between points of known distances apart showed that the rate of movement was not far from 20 miles per hour. Where they originally came from or whither they went we could not tell. They undoubtedly came from beyond the bay, which, in that place, is 14 miles across, and they must have been early on the wing. By 11.30 o'clock the numbers had declined, and it was evident the bulk of the flight was over, but for several days a great many individuals, evidently following the migratory movement, were observed.

My brother-in-law, Mr. Daniel Murray, who had been three days previously, viz. on the 20th of September, at Long Green, in Baltimore County, Md., saw a vast multitude of the same butterflies in migratory movement: they were seemingly exhausted in flight and settled on the trees in such multitudes as to give them the appearance of an autumnal forest. I was surprised at the great power of sustained flight exhibited, also at the great distance an individual butterfly could be seen by the unaided eye, at least across the water—not less than 1½ miles.—[M. G. Ellzey, M. D., Washington, D. C., January 20, 1887.

REPLY.—[Acknowledgment of letter, with references to articles which have been published on the subject.]

A Phylloxera on the Pecan.

* * * I send you a fuller specimen of the galls—the fungus growth on the Pecan trees I wrote you of. It only appears where the flowers appear, and in the green state when opened is full of the minutest insects. This is all of the information I can

give and I will be very glad to receive any information as to what treatment you will recommend to prevent any further formation on the tree; and if the tree can be brought to bearing fruit again I shall be delighted. * * *--[Mary E. Winston, Stanton, Miss., December 27, 1886.

REPLY.— * * * These galls interest us very much indeed. They are made by a plant-louse of the genus Phylloxera, but they are not absolutely identical with any which we have heretofore seen. They come nearest to a species of hickory plant-louse which occurs in New York State, and which was named by Dr. Fitch *Phylloxera caryæcaulis.* I would urge you to send us specimens of these galls in the spring and summer. You will find it a difficult pest to get rid of. The only sure method will be to destroy the galls in the early summer, and of course this will be difficult to do; but if you can manage to reach the highest points on the tree by ladders and cut the galls off with a pruning pole, you will find that very few will return next season. You will doubtless recognize the generic name of this insect as being that of the celebrated grape-root pest, but of course your insect is entirely distinct from those on grape. * * *.—[January 4, 1887.]

Anthrenus destroying Whalebone.

Inclosed insects and piece of whalebone, eaten by them, are from Mr. Merriam's establishment. Please examine and give me your report in course of time—address Alfred T. Brown, Rising Sun, Ind. This insect is not very numerous as yet, but as I discovered it here I made inquiry as to particulars, etc. The parties have not considered it as of any importance, but I tell them it may be in time if not investigated and checked.—[John P. Brown, 24 Lincoln Street, Boston, Mass.

REPLY. * * * The insect is one of the common museum pests and is closely allied to the Buffalo Carpet-beetle, and is called *Anthrenus varius.* This insect is a very general feeder, preferring animal substances, and its occurrence upon whalebone, although hitherto not recorded so far is I know, is not at all surprising. Without knowing how the whalebone is stored and without experimenting upon the effect which various insecticide substances would have upon the whalebone, it would be difficult for me to suggest a remedy. If the circumstances are such that the vapor of bi-sulphide of carbon can be used it will undoubtedly kill the beetle in all stages.—[October 15, 1886, to Mr. Alfred T. Brown, Rising Sun, Ind.]

GENERAL NOTES.

RESULTS OF PROFESSOR FORBES'S INVESTIGATIONS ON THE RELATION OF WHEAT CULTURE TO THE CHINCH BUG.

[Abstract from paper read before the ninth meeting of the Society for the Promotion of Agricultural Science at Cleveland in 1888.]

Southern Illinois.—Reports from 193 townships for 1887 show injury to corn, none in 4 (average wheat area in 1886 = 2,100 acres per township); slight in 3 (2,440 acres); considerable in 7 (2,530 acres); great in 30 (2,900 acres); very great in 37 (about 2,100 acres); nearly complete in 89 (2,700 acres); complete in 23 (4,400 acres). Wheat area in 1887 differed from 1886 only in a somewhat lower average; for 1888, from 1,500 acres (Chinch Bug injury to corn none) to nearly 4,100 acres (complete) per township. Corn area for 1887 was 1,800 acres (none) to 3,000

acres (complete), lowest intermediate points reached being 2,150 and 2,400 acres per township.

Western Illinois.—Reports from 124 townships (for 1887 ?) show injury to corn slight in 36 (average wheat area in 1886=1,600 acres per township), moderate in 7 (1,900 acres), considerable in 6 (nearly 2,100 acres); great in 2 (2,600 acres), very great in 2 (not given). Grass injury averaged half that to corn. In 1886 the wheat areas (corresponding to the first four degrees of Chinch Bug injury to corn) were 1,600, 1,900, nearly 2,100, and 2,600 acres, respectively, per township (the remaining grades being represented by too small a number of townships to afford an average). The corresponding acreage of wheat for 1887 was 2,000, 2,400, 3,600, and 3,870, respectively.

Central Illinois.—Reports from 177 townships (for 1887 ?) show injury to corn none in 110 (average wheat area per township in 1886=700 acres); a little in 29 (not given); moderate in 5 (not given); considerable in 11 (not given); great in 4 (not given); very great in 6 (3,100 acres); nearly complete in 11 (2,650 acres); complete in 1 (not given). Wheat area in 1887 was 1,050 acres (damage to corn none), 2,000 (a little), 1,100 (moderate), 2,400 (considerable), 3,000 (great), 3,900 (very great), 3,500 (nearly complete).

Eastern Illinois.—Reports from 94 townships (for 1887 ?) show injury to corn none in 65 (average wheat area per township in 1886=670 acres); considerable in 9 (nearly 1,800 acres); other headings gave too small numbers to average. Wheat area for 1887 was 980 acres per township (damage to corn none), 1,300 acres (a little), 2,200 acres (considerable), other headings too small to average.

Northern Illinois.—Reports show wheat areas for 1887 to be 333 acres per township (damage to corn [in 1887 ?] none), 337 acres (a little), 323 acres (moderate), 357 acres (considerable).

Whole State of Illinois.—Reports from 793 townships (for 1887 ?) show Chinch Bug injury to corn none in 384 (average wheat acreage per township in 1886=700), slight in 121 (1,100 acres), moderate in 30 (1,200 acres), considerable in 47 (1,500 acres), great in 37 (2,650 acres), very great in 48 (2,200 acres), nearly complete in 102 (2,700 acres), and complete in 24 (almost 4,500 acres). Reports from 811 townships for 1887 show average wheat acreage per township to be 952 (damage to corn none), 1,275 (slight), 1,644 (moderate), 1,802 ? (considerable), 3,036 ? (great), 2,423 ? (very great), 2,942 ? (nearly complete), and 4,156 ? (complete). Reports from townships for 1886 show Chinch Bug injury to grass none in 525; slight in 130; moderate in 71; considerable in 56; great in 5; very great in 5; corresponding wheat acreage per township increasing from less than 1,000 (damage none) to 4,400 (very great). Reports from townships for 1887 show average wheat area per township 850 acres (Chinch Bug injury to small grain, including wheat, none), 2,600 acres (considerable), 2,600 acres (very great), and 1,450 (complete).

Combining Chinch Bug injury to small grain, grasses, and corn, the

average wheat acreage per township ranged from 1,008 (no crop injured) to 2,936 (total damage equal to 18 on a scale of 24); numbers between these extremes being somewhat wavering, but on the whole a fairly regular ascending series, falling away at one point to 3.296 [*sic*!] and rising again to 3,296 later on.

AN OLD AMERICAN ACCOUNT OF THE BUFFALO GNAT.

Prof. Herbert Osborn has called our attention to the following short article which we deem of sufficient interest to publish:

In the American Journal of Science, Volume I (1818), there is an article entitled "On the Geology, Mineralogy, Scenery, and Curiosities of parts of Virginia, Tennessee, and the Alabama and Mississippi Territories, etc., with miscellaneous remarks. In a letter to the editor by the Rev. Elias Cornelius." In the body of this paper, on page 328, under the heading "*A Destructive Insect*," occurs the following interesting account of a fly which must certainly be the Buffalo Gnat, and which is, so far as we know, the earliest authentic account of its operations:

But I will not enlarge on a fact already familiar. I will ask your further indulgence only while I communicate a curious fact for the information of the zoologist.

In the Choctaw country, 130 miles northeast of Natchez, a part of the public road is rendered famous on account of the periodical return of a poisonous and destructive fly. Contrary to the custom of other insects, it always appears when the cold weather commences in December, and as invariably disappears on the approach of warm weather, which is about the 1st of April. It is said to have been remarked first in the winter of 1807, during a snow-storm, when its effects upon the cattle and horses were observed to be similar to those of the gnat and mosquito in summer, except that they were more severe. It continued to return at the same season of the year, without producing extensive mischief, until the winter of 1816, when it began to be generally fatal to the horses of travelers. So far as I recollect, it was stated that from thirty to forty traveling horses were destroyed during the winter. The consequences were alarming. In the wilderness, where a man's horse is his chief dependence, the traveler was surprised and distressed to see the beast sicken and die in convulsions, sometimes within three hours after encountering this little insect. Or if the animal were fortunate enough to live, a sickness followed, commonly attended with the sudden and entire shedding of the hair, which rendered the brute unfit for use.

Unwilling to believe that effects so dreadful could be produced by a cause apparently so trifling, travelers began to suspect that the Indians, or others, of whom they obtained food for their horses, had, for some base and selfish end, mingled poison with it. The greatest precaution was observed. They refused to stop at any house on the way, and carried for the distance of 40 or 50 miles their own provision, but after all suffered the same calamities. This excited a serious inquiry into the true cause of their distress. The fly which has been mentioned was known to be a most singular insect, and peculiarly troublesome to horses. At length it was admitted by all that the cause of the evils complained of could be no other than this insect. Other precautions have since been observed, particularly that of riding over the road infested with it in the night; and it now happens that comparatively few horses are destroyed. I am unable to describe it from my own observation. I passed over the same road in April last, only two weeks after it disappeared, and was obliged to take the description from others. Its color is a dark brown; it has an elongate head, with a small and sharp proboscis; and is in size between the gnat and mosquito. When it alights upon a horse, it darts through the hair, much like a gnat, and never

quitsits hold until removed by force. When a horse stops to drink, swarms fly about the head and crowd into the mouth, nostrils, and ears; hence it is supposed the poison is communicated inwardly. Whether this be true or not, the most fatal consequences result.

It is singular that from the time of its first appearance it has never extended for a greater distance than 40 miles in one direction, and usually it is confined to 15 miles. In no other part of the country has it ever been seen. From this fact it would seem probable that the cause of its existence is local. But what it is none can tell. After the warm weather commences it disappears as effectually from human observation as if it were annihilated. Towards the close of December it springs up all at once into being again and resumes the work of destruction. A fact so singular I could not have ventured to state without the best evidence of its reality. All the circumstances here related are familiar to hundreds, and were in almost every man's mouth when I passed through the country. In addition to this, they were confirmed by the account which I received from Col. John McKee, a gentleman of much intelligence and respectability, who is the present agent of the General Government for the Choctaw Nation. He has consented to obtain specimens of the insect for your examination, when it returns again, and will, I hope, accompany the transmission with a more perfect description than it has been possible for me to communicate.

NOTES ON PTEROMALUS PUPARUM.

We found a chrysalis of *Pieris rapæ* filled with the larvæ of this parasite on April 3, the larvæ pupating on the 6th. No further developments took place up to the 18th, when we left home, not to return again until the 20th of May, at which time the entire contents of the chrysalis had transformed to adults. This fully confirmed the opinion expressed by Professor Riley (Rep. Comm. Agr. 1883, p. 112), that a large proportion of them undoubtedly wintered over in the bodies of the chrysalids and emerged the following spring.

On the morning of August 9 we observed a larva of *Pieris protodice* Boisd., in the act of transforming to the chrysalis. Near by, and very evidently watching this transformation, were a male and female of this parasite. The trio were observed several times during the early part of the day, the parasites always on guard, as it were, although the female was several times observed to attempt oviposition, in every case, however, being deterred from doing so by the jerking of the larva, now in a semi-pupal state During one of these visits the male was driven away, but soon returned. About 6 p. m., the last observation of the day, the transformation of the larva, while not complete, had so far advanced as to prevent the radical movements which had characterized its struggles during the forenoon, and the female was busily engaged in her work of oviposition, the male still present as a spectator (?). On the morning of the 10th the chrysalis, now fully developed, was removed and placed in a glass jar, awaiting further developments.

On the morning of the 27th, seventeen days after, the adult Pteromalus were observed issuing from the chrysalis in great numbers. After all had emerged they were counted and found to number 68 males and 4 females. The same parasite had been reared from a similar chrysalis on August 13, but the individuals were not counted.—F. M. Webster.

ANOTHER HUMAN BOT-FLY.

Apropos of the interesting article on "A Man-infesting Bot," INSECT LIFE No. 3 (Vol. I, p. 76–80) it may be in order to call attention to an account of a similar or identical species presented in some "Additional Observations on the Parasites of Man and Domestic Animals," appended to Prof. A. E. Verrill's valuable Reports on the External and Internal Parasites of Man and Domestic Animals, and which does not seem to have been familiar to Dr. Matas at the time of writing his article. In the case recorded by Professor Verrill, in which the insect is referred doubtfully to *Dermatobia noxialis*, it appears that the patient, a resident of Mississippi, became infested in that State, which would indicate an extension of the species into this country, or the occurrence of a very nearly related species here.

In the last report (page 95) it was mentioned that a species of bot-fly lives in the larval state beneath the human skin, forming painful tumors. But such instances had been observed only in the tropical parts of Central and South America. It is, therefore, of interest to record a similar case in the United States. In this instance a young woman twenty-two years old, residing at Meridian, Miss., was the victim of the insect. The larvæ, developed from eggs deposited in the skin by the fly, caused great irritation and pain in the subcutaneous tissues, resulting in large abscesses, from which the mature larvæ finally escaped.

I am indebted to Dr. William B. Fletcher, of Indianapolis, Ind., for a specimen of the larva of the insect which was taken from this patient and sent to him by Dr. James Hughes, who treated the case. Whether it be identical with the South American species can not be determined from the larvæ alone.—H. Osborn.

GEOGRAPHICAL RANGE OF THE CHINCH BUG.

In the section on the distribution of this insect, in Bulletin 17 of this Division, and in the Annual Report for 1887, only two localities outside of the United States were mentioned, viz: Cuba, according to Signoret and Uhler, and Tamaulipas, Mexico, according to Uhler. We have since noticed that Mr. W. L. Distant records it as extending southward through Mexico, Guatemala, and Honduras, and in the Biologia Centrali-Americana records it as captured by Champion at the following points:

Guatemala.—San Gerónimo, Paso Antonio, Panzos, Champerico, and Rio Naranjo.
Panama.—Volcan de Chiriqui, 2,000–3,000 ft.

DAMAGE TO FRUIT BY THE ADULT OF ALLORHINA.

The *Pacific Rural Press* calls attention to the damage done by an Allorhina to ripe peaches in Arizona. The statement is made that it appears after the first summer rains, apparently from the low moist lands, and immediately seeks the peach orchards, where it selects the choicest fruit and ruins them. In case there are no ripening peaches it feeds upon grapes, and even upon growing corn-stalks. It disappears during the latter part of August. When they are plentiful several will

attack a ripe peach simultaneously and devour all of its mellow portion in a few hours. The habits of this beetle seem then to be quite similar to those of the allied species in the east. In the south *A. nitida* is called the "Fig-eater" and it is said to seriously injure grapes. The same species was very abundant in the District of Columbia during last season and at the Benning's Station of this Department the beetle swarmed in great numbers upon the peach trees and ruined a great portion of the fruit. We have always supposed that this beetle only attacked decaying, over-ripe, or injured fruit, but the evidence is now growing so strong that it will attack perfect fruit that careful observations are needed.

THE IMBRICATED SNOUT-BEETLE.

This insect has added another food-plant to its already long list. In the Third Report on the Insects of Missouri we recorded damage to Apple, Cherry trees and Gooseberry bushes by gnawing the twigs and fruit. In 1879 Professor Comstock added to the list Onions, Radishes, Cabbage, Beans, Watermelons, Muskmelons, Cucumbers, Squashes, and Beets. A recent correspondent of the *Prairie Farmer* (Mr. J. P. Coulter, Cramer, Ill., issue of June 23, 1888) records damage to Potato. He states that the insect is fully as destructive as the Colorado Potato Beetle, and that its manner of operating is about the same as the other, except that it probably cuts the stalk off more frequently, and "very generally cuts off the other parts, with the soft undeveloped leaves." The editorial comment ignores the previous discovery upon vegetables, and suggests no remedy. Paris green or London purple, however, will probably prove effectual.

NOTES ON ACRIDIDÆ IN LOS ANGELES, CAL.

Acridium vagum.—Adults taken February 5, May 12, May 17, July 1, August 4, August 29, September 4 (in coitu), and November 13. Frequents tall weeds and trees; they feed on the leaves of orange trees. The females in life are green, variously dotted and marked with yellow; antennæ, a stripe below and another back of each eye, besides a stripe on top of the head and thorax, yellow; wing-covers towards their tips tinged with brown; hind femora marked with black before their tips; hind tibiæ reddish, provided behind with two rows of spines which are yellow, tipped with black; hind tarsi reddish above, grayish-brown below; length, $2\frac{1}{4}$ inches. The half-grown larva is green, irregularly dotted with darker and marked with whitish dashes; a white stripe on each side of the abdomen and another below each eye; each eye is marked with four vertical dashes, of which the hindmost is widest and east distinct; spines of hind tibiæ white tipped with black. Found July 26 and December 15.

Melanoplus devastator, *affinis* and *cyanipes.*—Adults taken November 13, and *cyanipes* February 4; in coitu October 1.

Lactista gibbosa.—Adults taken January 15, February 5 and 12, April 12, May 12 and 17, July 26, and November 13. It sometimes makes a rattling noise while on the wing.

Encoptolophus sordidus.—Adults taken February 12 and November 13. Several larvæ were taken November 13.

Œdocara strangulata or *Stirapleura decussatus.*—Adults taken February 5 and November 13.

Trimerotropis vinculata.—Adults taken May 12 and 17, June 6, July 1 and 24, and November 13. It sometimes makes a rattling noise while on the wing.

Œdipoda venusta.—Adults seen June 6 for the first time in the sea-son; also seen July 26.

Conozoa wallula.—Adults taken July 1.

Chimerocephala pacifica.—Larva half grown, February 4; adults taken April 28.

Thrincus californicus.—Adults taken only in early spring.—D. W. Coquillett.

CHLORIDEA RHEXIA INJURING TOBACCO.

We have not yet published the fact that during the summer of 1886 the wide-spread and polyphagous larva of this insect did considerable damage to tobacco crops in parts of Georgia and Alabama. We deferred publication awaiting further facts, but it seems desirable that this note should go upon record. The larvæ were first sent us July 10, by Hon. J. T. Henderson, of Atlanta, with the information that they were found upon the bud of the tobacco plant. Specimens were also received from J. S. Newman, of Auburn, Ala., and J. S. Barnwell, of Darien, Ga. The latter gentleman stated that in general the adult of this creature did more damage to his tobacco plants than the large tobacco-worm. When young and about a quarter of an inch in length it lives, according to this gentleman, in the central stalk of young leaves and eats so many holes in them that the tobacco is utterly unfit for market as "wrappers," even if it is good for "fillers." As wrappers are so much more valuable in the market he considered it a terrible blight on the industry in his locality.

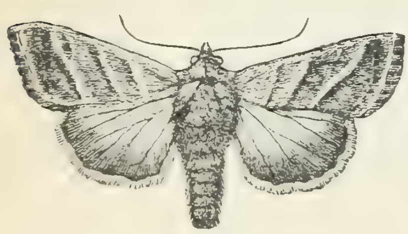


FIG. 49.—*Chloridea rhexia*—natural size (after Riley).

So far as we know this insect has never before been recorded as feeding upon Tobacco. Its commonest food-plant in the South is "Ground Cherry" (*Physalis viscosa*), and the other species of the same genus. The larva feeds upon the little bolls of this plant. It also feeds upon other wild Solanaceous plants, and we have found it upon *Solanum seiglinge* in St. Louis. It has been received at the Department from South Carolina feeding upon cultivated Geranium, and in Ohio it feeds upon a Composite of the genus Ageratum. The probabilities are that in Georgia

and Alabama the insect turned its attention from the Ground Cherry to Tobacco for some temporary reason, that the summer of 1886 was an exceptional one, and that the insect will not find in Tobacco a stable food-plant. It is possible, however, that it may become a permanent enemy to the crop. There are probably at least three annual generations in Georgia and Alabama, and the insect winters in the pupa state underground. The pupa was sent to us several times in the course of the Cotton Worm investigation as belonging in all probability to the Cotton Worm, and on page 17 of the Fourth Report of the Entomological Commission (where the insect is considered under the name of *Aspila virescens*) an interesting account is given of this mistaken identity. Should the insect again become abundant upon Tobacco, a good remedy will be difficult to find. The best which we can suggest will be the use of Pyrethrum powder, diluted either with flour or plaster in the proportion of one part to ten.

BIRDS AND THE WHITE GRUB.

Mrs. Mary Treat, in a recent number of *Orchard and Garden*, records observations showing that a family of Brown Thrushes fed abundantly upon White Grubs. She has also seen the Robin feeding upon this larva.

DOSING TREES WITH SULPHUR AND OTHER SUBSTANCES.

There is a prevailing and popular idea that insects may be driven from trees by boring holes through the bark into the wood, placing sulphur therein, and plugging the hole. There are some persons who profess to have tried the experiment with success, to have cleared trees, such as Elms of the destroying worm, etc. Prof. C. V. Riley, Entomologist of the Department of Agriculture, pronounces these remedies fallacious.

"The belief in this efficacy," he says, "is founded on the supposition that the poison passes with the sap into general circulation and with it into the foliage, and is destructive to leaf-feeding insects. It is an entirely unfounded idea, and is based upon ignorance of the fact that the substance remains intact, and is not taken up in the circulation. Instances where it has seemed to succeed have been recorded, and in such cases its apparent efficacy was due to a coincident disappearance of the insect from some other cause. Sulphur which I plugged up in such holes many years ago was found to be perfectly unchanged after many months. All such remedies may be stamped as nonsense."—*Scientific American*, December 8, 1888, vol. 59, p. 353.

ALUM AS A CURRANT WORM REMEDY.

At the Massachusetts Station, Prof. Fernald has been experimenting with alum as a destroyer of Currant Worms, and concludes that "alum

as an insecticide for the Currant Worm is a perfect failure. In explanation of the success reported by various horticulturists in the use of this substance, it is possible some one who tried showering Currant Worms with alum water did it just before they were done feeding, and when they went down into the ground he supposed his application had destroyed them, and at once reported his supposed success in the papers." —*American Garden*, December, 1888, vol. 9, p. 432.

AN AUSTRALIAN EXPERIMENT.

In *The Garden and Forest* (Adelaide, South Australia) for November 1, 1888, Mr. Frazer S. Crawford makes a quite favorable report on the efficacy of the resin and soda compound recommended by Mr. Koebele in our report for 1886, when applied to Orange Aphis and to the "Round Orange-scale" (*Aspidiotus aurantii*). In Mr. Crawford's experiments equal parts of soda and resin were used in order to dissolve the latter more readily. The application almost immediately killed every Aphis on the tree treated, and after a week's time resulted in a change of color of many of the scales. After three weeks many adult females were seen alive, and larvæ were noted on the twigs. Two weeks later some old scales and a few newly formed scales were noted. Mr. Crawford thinks a second application would be necessary to completely free the trees, the young scales and larvæ being easily destroyed by one treatment. Nearly all the infested leaves are said to have fallen from the trees, while those free from scale were uninjured, a somewhat remarkable and hardly possible result.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

JANUARY 3, 1889.—Forty-seventh regular meeting. The reports of the Treasurer, Recording Secretary, and Corresponding Secretary for the past year were presented and accepted.

Mr. C. L. Marlatt was elected an active member of the society.

The annual election of officers followed. It was moved and passed that all the officers be re-elected to a second term, except the Recording Secretary. Dr. Wm. H. Fox was elected to the office of Recording Secretary *vice* J. B. Smith, resigned.

The annual address of the President was delivered by Mr. E. A. Schwarz, who took for his subject "On the Coleoptera Common to North America and Other Faunal Regions." The large number of species taken into consideration was divided into two classes: (1) Those distributed by natural dispersion, viz, the circumpolar fauna, the endemic species common to both North and South America, and the migratory species; (2) those distributed by the agency of man, viz, non-intentional importation, non-intentional introduction, and intentional introduction. The various intricate phases which the subject assumes were discussed and illustrated by examples.

The question was discussed by Dr. Riley, Mr. Smith, Dr. Marx, Dr. Fox, Mr. Howard, and C. R. Dodge from the standpoints of Lepidoptera, Arachnida, and Hymenoptera.

The meeting then adjourned.

TYLER TOWNSEND,
For Recording Secretary.

SPECIAL NOTES.

Mr. T. D. A. Cockerell, of West Cliff, Custer County, Colo., reminds us, after reading the note on the subject of the food habits of the Calandridæ in No. 6 (page 198), that he had sent us a larva found in the base of *Cereus viridiflorus* which we determined as probably the larva of *Cactophagus validus.* It will be remembered that the statement in INSECT LIFE was to the effect that this beetle had been found exclusively under decaying Opuntia leaves. We did not insert this instance in our list of the food habits of this beetle for the reason that the determination from the larva alone might have been incorrect.

Important to Coleopterists.—The edition of the "Classification of the Coleoptera of North America," by J. L. Le Conte and Geo. H. Horn, published in 1883 by the Smithsonian Institution, was so small that it was exhausted almost as soon as issued. The work is indispensable to every student of North American Coleoptera, and in demand from Coleopterists the world over. We are glad, therefore, to learn that a new reprint from the original stereotype plates, undertaken by Dr. Horn, has just been completed. Copies may be obtained for $2.50 each (which includes postage) by addressing the following parties in Philadelphia, Pa: Dr. George H. Horn, 874 North Fourth Street; Mr. E. T. Cresson, Post-office Box 1577; and Dr. A. E. Foote, 1223 Belmont Avenue.

In this number we resume the publication of the much-needed revision of Chambers' Index by Lord Walsingham, whose interest in the Microlepidopterous fauna of North America is a matter of congratulation to all working entomologists on this side of the Atlantic.

The second Shipment of Icerya Parasites.—The December steamer from Australia brought over the second lot of Australian parasites of the Cottony Cushion-scale. Mr. Koebele had informed us by letter that he had forwarded in this lot at least 12,000 healthy living parasites,

mostly in the pupa state, and we had every hope that they would arrive in as good shape as the first lot. We are much disappointed, therefore, to learn from Mr. Coquillett that the shipment reached him in very poor condition on December 9, three days after the publication of a letter from Mr. Koebele to Mr. Klee, which came on the same steamer. Mr. Klee had some difficulty in getting the boxes from the custom-house, and wrote Mr. Coquillett that "when he got them the boxes were all broken up and had evidently been repacked since Koebele packed them for shipment." When Mr. Coquillett received them there were eight tin and two wooden boxes; "all of the tin boxes were mashed flat and their contents were very moldy." There was in them only one living Lestophonus and one of its parasites, one Coccinellid beetle, and a Chrysopa larva. One of the wooden boxes had also been broken open. Mr. Klee, writing later, explains that the ice in the ice-house in which the boxes were confined had fallen upon the packages and smashed some or most of them. It was several days before he could obtain them from the steamer and the contents of those boxes which were partly open were covered with mold. He repacked and forwarded them as soon as he could.

The accident of the falling ice was perhaps impossible to avoid, although carelessness on the part of the steamer hands might have been at the bottom of it. The delay on the part of the custom-house authorities, however, was no accident, and we have taken steps to prevent its recurrence. The Secretary of the Treasury has very courteously issued an order to the collector of the port at San Francisco to allow future packages to enter free of duties and charges, and to forward them unopened and without unnecessary delay to Mr. Coquillett.

A secondary Icerya Parasite.—We were again disappointed, although not surprised, to learn from Mr. Koebele's last letter that he had discovered a parasite of the *Lestophonus* which he has been sending to this country. It was rather to be expected that the hopeful Dipterous parasite would have its enemies, but it was none the less a discouraging thing to find that there is one. Mr. Koebele sent a series of pinned specimens of this secondary parasite to us direct from Australia, and Mr. Coquillett has since forwarded a series which he secured from Mr. Koebele's last sending of the primary parasites. This secondary parasite is a very strange form, and we hope to characterize it in connection with a number of unpublished Icerya enemies in our Annual Report for 1888. It will be sufficient at this time to state that it is a new and remarkable genus of the peculiar Chalcid sub-family *Elasminæ*. Mr. Koebele's warning concerning this secondary parasite was received in abundant time and put Mr. Coquillett on his guard concerning it, and the latter has exercised such care that at last account not one of them has escaped to perpetuate its kind.

Entomological Work at Cornell.—Bulletin No. 3 of the Agricultural Experiment Station at Cornell University contains three entomological articles by Professor Comstock; the first on the Insectary of Cornell University, the second on Preventing the Ravages of Wire Worms, and the third on the Destruction of the Plum Curculio by Poisons. The first article contains a description of the new building which has been erected by the experiment station for work upon insects, with a full-page illustration of the building. The building contains a laboratory for the experimenter and his artist, a workshop and a dark room for photograph purposes; also quarters for a janitor and a store-room for apparatus. In the basement there is a boiler for heating the building and a conservatory with conveniences for potting plants; a coal cellar and a cold-room for the storage of hibernating insects. Back of the main building, which is a two-story cottage, and attached to it, is the conservatory, which is divided by a partition into two rooms each 30 feet in length, one of which is used as a hot-house and the other as a cold-house. Several new devices for use in the study of insects are also described, the most important one being a root-cage for observing subterranean insects. We have for many years hoped to build such an insectarium on the Department grounds to aid us in the laboratory work of the Division, and the fact that plans that would permit the realization of this wish have been before Congress for two years without action very well illustrates the difficulties in accomplishing anything of this sort at Washington as compared with some of our State institutions.

The second article relates the results of a series of experiments in trapping Wire Worms and their parent beetles. It was found that by the baits used—sliced potatoes, unsweetened dough, sweetened dough, and clover—many more mature beetles than larvæ were captured. A number of interesting facts were proved but the principal result arrived at is that by the use of small bunches of cut clover (the best bait) poisoned with Paris green water and placed at intervals through a corn field, under bits of board, large numbers of the parent beetles can be killed.

Sweetened dough, made of one part of sugar to ten parts corn meal and sufficient water to make a dough, was found to be next in efficacy to the clover, although its attractiveness was considerably less. The use of the clover bait is the same idea which we have put into practice and recommended for Cut Worms, and doubtless, in view of Professor Comstock's experiments, the same trap will attract both Cut Worms and Wire Worms. It is noticeable that the Click Beetle, second in abundance of any of those caught in traps, was *Drasterius dorsalis*, and it is worth while to remark that our experience has shown that this insect is quite likely to be a beneficial species, feeding in its larval state, at least a portion of the time, upon other insects. Figure 11 of the paper is unfortunately not named and can not be identified from the illustration.

The third article mentions the feeding habits of the adult Plum Curculio, and details observations which confirm what has long been known to some of us, viz, that this species gnaws holes in apples in August.

THE RED BUG OR COTTON STAINER.

(*Dysdercus suturellus* H. Schf.)

The damage done to the Orange crop in parts of Florida during the present winter by this comparatively well-known pest, has suggested the desirability of a general article upon its life history and habits, which is herewith presented.

GEOGRAPHICAL DISTRIBUTION.

The Cotton Stainer is a native of tropical America and the West Indies, but has long been known as an enemy to the cotton crop in the extreme southern United States. In the Bahamas during the period of cotton cultivation it was perhaps the most serious enemy to the crop. According to the results of the investigation made by a committee of the general assembly of these islands in 1801, this bug preceded all other causes of loss in the cultivation of Cotton. In the winter of 1878–'79 Mr. Schwarz found it in great numbers in the Bahamas, and considers it by far the greatest enemy to Cotton. On and in a single boll he counted 54 specimens, young and old.

That the insect also occurs in Cuba was proved by the receipt of specimens found on a cotton plant in 1879 in Havana, and sent to the Department by Mr. B. W. Law, of that city. We have no knowledge, however, of its occurrence in South America. It is not to be found among the large collections of insects found upon the cotton plant by Messrs. Branner and Koebele during the winter of 1883–'84 at Pará, Maranhão, Pernambuco, and Bahia, Brazil, although many other Heteropterous insects were collected by them upon Cotton. In Florida Mr. Glover found the Cotton Stainer prevalent at Ocala and Palatka in 1858, injuring the cotton plant. In his report for 1875 he again treats of its damage to Cotton, but up to that time it had not, apparently, been reported as damaging the Orange or any other cultivated crop. In our own investigations we have repeatedly met with it in Florida.

FOOD-PLANTS.

The Red Bug as yet damages no cultivated crop except Cotton and the Orange. Mr. Hubbard has, however, observed it feeding upon the seeds of certain malvaceous plants which he was not able to determine specifically. Professor Comstock, in the winter of 1879, found it upon a native species of Rose Mallow (*Hibiscus* sp.), and also upon an introduced species which he calls *Hibiscus fulgidius*, at Maitland, Fla. He

also found it upon the leaves of Guava which were infested by a Mealy Bug, but was unable to determine whether the Red Bugs were feeding upon the leaves of the plant or upon the sweet excretion of the Mealy Bug. According to the Rev. W. F. Nigels, of Dunedin, Fla., it is also found on what is there termed the "Spanish Cocklebur," and upon the "Poisonous Nightshade;" but this statement has not been confirmed by other observers.*

HABITS AND NATURAL HISTORY.

The Egg.—We do not possess authoritative specimens of the egg of this insect to figure and describe, and this is particularly unfortunate, as published accounts of the egg and method of oviposition do not agree. Glover says:

> The eggs, to the number of twenty or thirty, are deposited on the leaves or stalks of the cotton-plant (*Gossypium*).

Professor Comstock, in his article previously mentioned, gives the following paragraph to the eggs:

> The eggs of the cotton-stainer were sent to the Department in April by Mr. H. S. Williams, of Rock Ledge, Fla. They were laid in a group of twenty-one, upon the underside of an orange leaf. They were amber-colored and oval in shape. The young bugs made their exit through nearly circular holes on the upper side, near one end. The eggs appear smooth and glistening to the naked eye, but an examination with a lens shows them to be densely covered with hexagonal impressions.

Mr. Hubbard quotes Professor Comstock's statement, but is of the opinion that the eggs are not normally deposited upon leaves. "In winter at least," he says, "and around gin-houses, the eggs are dropped loosely in the sand, and among the heaps of cotton-seed upon which the bugs are feeding." Mr. Schwarz, who observed this insect in the Bahamas in the winter of 1878–'79, did not find the eggs, although, had they been laid upon the leaves of the cotton trees, they could hardly have failed to attract his notice, owing to the enormous abundance of the insect in all other stages. He says (Report upon Cotton Insects, 1879, p. 348):

> According to the opinion of the natives, the eggs of the cotton bug are deposited in the cracks of the rock. I myself found a number of eggs on the leaf of a plant growing under a cotton tree, but failed to rear the insect, and am therefore not sure that said eggs are really those of the cotton bug.

Mr. Schwarz further says in conversation that both young and old bugs were swarming in and out of the crevices in the rocks and that the supposition of the natives above mentioned is probably correct. There is no soil proper at these places, the vegetation apparently growing out of the coral rock.

It will therefore be seen that the statements of Glover and Comstock are open to doubt in view of the positive observations of Hubbard and

* Mr. Nigels has since sent us specimens of the "Spanish Cocklebur," which proves to be *Urena lobata*, while he writes that the "Nightshade" which he mentions is *Solanum nigrum*.

the negative ones of Schwarz. The eggs described by Comstock are still in the collection of the Department of Agriculture, and a careful examination of the young larvæ which hatched from them at once shows that they belong to a different species (*cf.* Figs. 50, *e* and 51, *a*). We have attempted to learn to what species they really belong, but have been unable to do so on account of the immaturity of the larvæ. The eggs resemble in shape and sculpture those of *Metapodius femoratus* and *Euthoctha galeator*, two predaceous bugs found upon orange, and are intermediate between them in size, but the young bugs differ from either of these species. We have shown these eggs and the young larvæ which hatched from them at Fig. 50. One of the egg-shells contained within it an interesting egg-parasite which will be described by Mr. Howard in another part of this number.

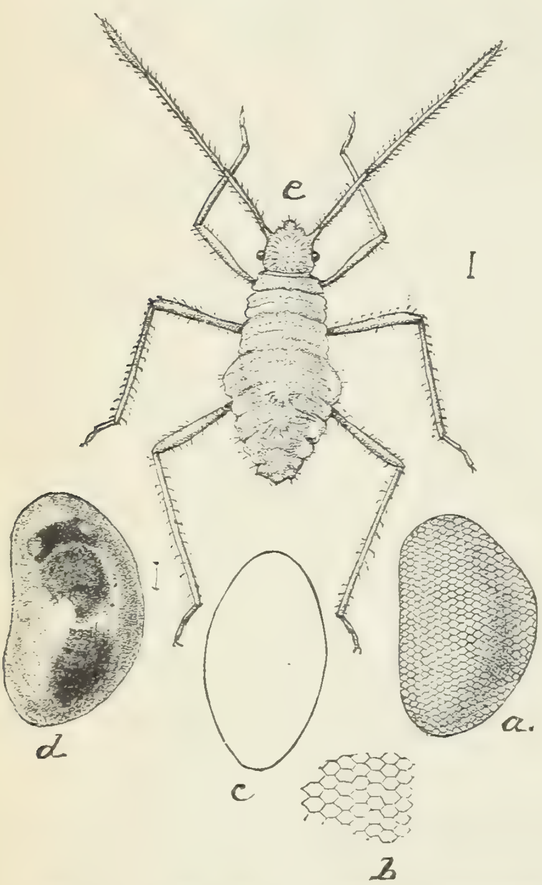


FIG. 50.—*a*, egg taken for that of *Dysdercus suturellus* by Comstock, side view—enlarged; *b*, portion of surface—still more enlarged; *c*, dorsal view of same egg; *d*, same with contained parasite; *e*, larva from same—all enlarged (original).

Comstock's statement having thus been disproved, Glover's becomes all the more doubtful, and Hubbard's account is the only one upon which we can confidently rely. His few words of description of the egg are as follows:

> The eggs are oval in shape, amber-colored, with a pearly luster, and present, under the lens, a pattern of closely reticulated lines.

The other preparatory Stages.—Among the alcoholic and other material of the Red Bug sent to the Department at different times, we have been able to distinguish four preparatory stages which undoubtedly represent separate molts, and, from the gradation in size, probably represent the complete life of the insect. They are shown at Fig. 51, *a*, *b*, and *c*, and Fig. 52, *a*. All were drawn from alcoholic specimens except *b*, which was a dry and somewhat shriveled pinned specimen. This probably accounts for the laterally contracted abdomen of this drawing as compared with *c*. The color in all is bright red, the wing pads in *c* and Fig. 52, *a*, being black, and the lines separating the segments very light yellow. These yellow bands are even more marked on the under side of the abdomen, while the most conspicuous marking, and one which persists through all stages, is the narrow yellow band around the front border of the prothorax just behind the head. All of the legs and the antennæ are reddish-yellow in the first stage, becoming yellowish-brown in the second stage, the tibiæ and tarsi darker than

the femora. In the third and fourth stages the legs and antennæ are yellow-brown, the antennæ darker towards tip, and the tibiæ and tarsi, particularly those of the hind legs, darker than the femora. The sizes

FIG. 51.—*Dysdercus suturellus*: *a*, first stage; *b*, second, *c*, third—all enlarged (original).

of the drawings themselves in Figs. 51 and 52 are not relative, but the length of the hair lines will show the actual size of each stage.

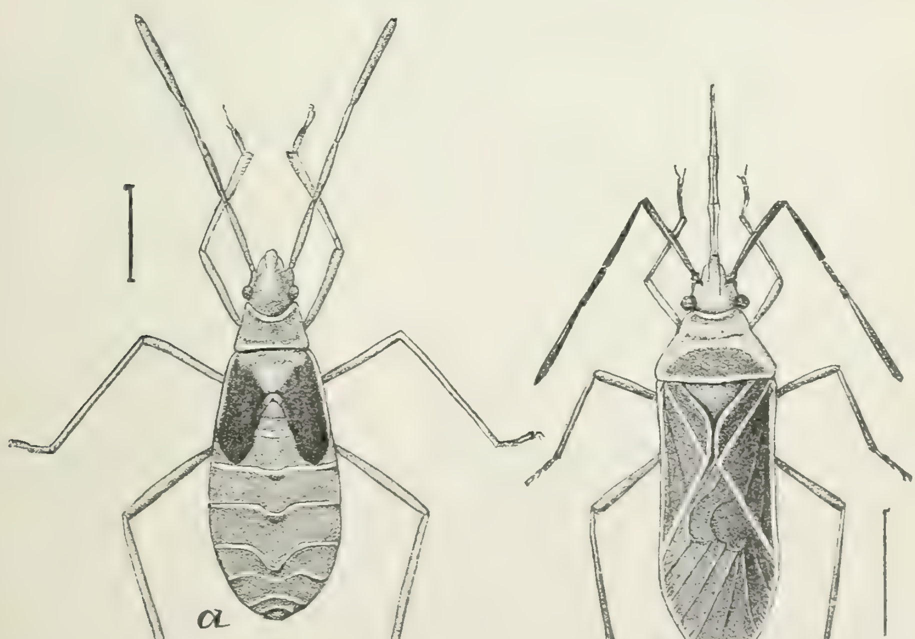


FIG. 52.—*Dysdercus suturellus*: *a*, fourth stage, or pupa; *b*, adult—both enlarged (original).

The Adult.—The adult bug varies in length from 10^{mm} to 15^{mm} (0.4 to 0.6 inch). The hinder portion of the thorax and the wing-covers varies from dark brown to black, the latter being crossed with narrow lines of

light yellow, as shown in Fig. 52, *b*. The head and forepart of the thorax are red, varying from light to dark. The underside of the body is bright red, with the segments outlined by narrow light-yellow bands. The antennæ are black, as are also all tibiæ and tarsi; the femora or thighs are red. The beak is red, except the last joint which is black. All of these colorational markings vary considerably in intensity.

Number of Broods and Hibernation.—We can make no just estimate of the number of annual generations. Wherever the Red Bug is observed it is found in nearly all stages, and individuals have never been carried through their life round. Occurring apparently only in subtropical localities, it breeds steadily all the year round, and insects of all stages are to be found in December and January.

Work of the Insect on Cotton—The Cotton plant seems to be the original food of this species. Mr. Glover's statement concerning its method of work on Cotton is as follows:

It drains the sap from the bolls by its puncture, causing them to become diminutive or abortive; but the principal injury it does is by sucking the juices of the seed and boll, and then voiding an excrementitious liquid which stains the cotton fiber yellow or reddish, and very much depreciates its value in the market, the stains being indelible. (Ann. Rept. Dept. Agr., 1858, p. 271.)

Of late years the damage done to cotton has not caused much complaint, and indeed Florida is the only State which has ever suffered to any extent by the damage which this insect does to this crop.

Work of the Insect upon the Orange.—Glover, writing upon this species as late as 1875, does not seem to have ever known it to damage oranges, as otherwise he would undoubtedly have mentioned this habit. Shortly thereafter, however, the Red Bug acquired the habit which to-day makes it a serious enemy to the orange crop in Florida. This habit was first called to the attention of this Department in December, 1879, when Mr. S. W. Carson, of Fort Meade, Fla., wrote:

I send you to-day some bugs which are excessively injurious to sweet oranges after they ripen. The tree from which these were taken had thousands on it. They set to sucking, and never cease until the rind is punctured to the pulp; soon decay sets in, and the fruit drops. Scores will fall off in twenty-four hours. We are ruined in the orange culture if they continue.

In the early spring of 1880 Professor Comstock, then Entomologist of the Department, visited Florida and paid some attention to this insect. He ascertained that the principal injury was done where cotton was planted in close proximity to orange trees, and learned of one instance where cotton was planted between the rows of orange trees with the result that nine-tenths of the oranges were destroyed. As Mr. Hubbard's Report upon Insects affecting the Orange is out of print we may quote his excellent general remarks on the damage to Orange:

In January and February, if the weather is mild, the Red Bugs desert the fields where they have lingered upon the dead trash and waste of the cotton, and suddenly make their appearance in the orage groves. Usually this takes place only in groves adjoining fields that have been planted in cotton: but, as they are strong fliers, the

bugs not unfrequently migrate in considerable numbers to a distance even of several miles.

At first, only adults are seen; these at once attack the fruit upon the trees. A week or ten days later, the wingless young appear, always upon the ground, clustering upon the fallen fruit. If the trees are not stripped and the fruit harvested before the young brood become adult and acquire wings, the entire crop will be lost. Even the packing-house is not safe from invasion, and fruit is apt to be destroyed after it has been gathered and stored in the bins.

In puncturing the orange, the bugs insert their slender sucking beak, often its entire length, and although the oil of the rind forms their principal food, they nevertheless frequently regale themselves with draughts of juice from the pulp within, and are sometimes seen to suck the juices from the surface of split or injured fruit, tapping it with the tips of their probosces, after the manner of flies.

The sucking-tube, having the fineness of a hair, leaves no visible wound upon the outside of the fruit, and within, no indication of its passage. An orange which has been attacked therefore shows no outward sign of injury; nevertheless, a single puncture causes it to drop in a few hours from the tree, and to decay in one or two days.

It is quite useless to pack for shipment to a distance the fruit from a grove which is attacked by Red Bugs, since the unsound fruit decays in the packages and soon ruins the whole.

During November and December, 1888, damage of this character was reported from Florida. Mr. A. L. Duncan, of Dunedin, Hillsborough County, wrote under date of November 8, stating that it had recently appeared in great numbers in his vicinity, but that it was confined to a few trees. A subsequent letter (November 22) from the same gentleman stated that there is no cotton grown in his neighborhood, "or at least very little," and that the bug was spreading through most of the groves up and down the coast. Under date of January 2 he again wrote that the damage had ceased and that the bugs had almost entirely disappeared. Rev. William F. Nigels, of the same place, writing to the Florida Farmer and Fruit-Grower, December 10, makes several statements which are of considerable interest. His letter, a copy of which was forwarded to us by Prof. Curtiss, the editor of the Farmer and Fruit-Grower, is as follows:

A new enemy to the orange is giving trouble to the orange growers of this peninsula; it is the old-time cotton bug, the insect that stains the cotton in the boll, which gives it a yellowish color and hence lessens its market value. A few years ago this insect was known to exist in two orange groves about 7 miles from here, in one of which the fruit was nearly all destroyed by it, and it seemed to have disappeared. A month ago, however, it reappeared in great numbers in different localities, and it seemed to attack the orange trees at once. As no cotton has been raised here for a number of years, it is difficult to account for its sudden appearance and in such numbers. My own trees have been, thus far, singularly exempt from its ravages, although I have trees in three different fields, while the insect exists in several surrounding groves.

I have occasionally, heretofore, found a few, both young and old, among dead weeds, in fence corners, and where trash had accumulated; but I always destroyed every one I could find, knowing that they did no apparent good and might do evil; and to this precaution and care may be due its absence from my trees. From limited observation, I judge that its habitat is not at all peculiar; as already stated, it can live anywhere and on anything, and survive our light frosts. I have found it mostly

on what is termed here the Spanish cocklebur, but I have seen it also on the poisonous nightshade. Its modest taste seems to have changed of late, and it has found the rich juice of the orange more palatable than juices of wild and noxious weeds; with its long proboscis it pierces the rind of the orange and sucks its sweets until satiated, and every orange thus punctured falls to the ground within three or four days. I have seen every orange from a full tree on the ground, the result of the voracious enemy. Five hundred or more of the insects can be seen on one tree, and a dozen on one orange. The loss to the grove mentioned above amounted to $500.

The question is, is there a limit to its depredations and can it be exterminated?

A brief history of its habits, with directions how to destroy it, would be very timely and prevent much loss.

This orange-feeding habit is then a temporary one in that it is indulged in only while the oranges are ripening and just before picking. During the rest of the year it must feed upon some other food-plant, and if not upon cotton, probably upon some malvaceous plant allied to it. The statement of Rev. W. F. Nigels, quoted under the section Food-plants, would indicate that it breeds upon other wild plants, but here there arises a possibility that Mr. Nigels has mistaken some other allied insect for the Red Bug.

REMEDIES.

It is very important that the most careful observations should be made in the neighborhood of orange groves subject to the attacks of this insect upon the food-plants other than cotton, upon which it subsists during the season prior to its migration to the orange.

Up to the present year the orange crop seems to have been only occasionally damaged, and this is evidently only when the bugs have enormously increased during a favorable season upon their more normal food. These food-plants once discovered for a given locality, a slight examination every year will indicate whether the bugs are increasing unduly, and if this is found to be the case, they can be destroyed in time to prevent the winter damage to oranges. Where cotton is grown near (within a few miles of) the grove, the probabilities are that the bugs will have migrated from the cotton fields after picking, and in such case, and when the bugs seem particularly abundant, it will pay the neighboring orange growers to procure the spraying of the cotton fields with a kerosene emulsion. Where there is absolutely no cotton in the neighborhood, wild malvaceous plants should be watched, and observers should search for whatever other wild plants form the food of the bugs. If this suggestion is followed out the damage done to oranges will undoubtedly be greatly lessened.

When the oranges are actually being attacked, it is difficult to fight the insects. Mr. Duncan, in his letter of November 22, stated that one of his neighbors, upon the first appearance of bugs upon his trees, secured a spraying outfit and a quantity of the Hubbard kerosene emulsion and went to work, but gave it up in two days. The emulsion killed the bugs but others kept coming in, and it was impracticable to continu-

ally spray the trees. He therefore picked the fruit as the only remedy. The same difficulty—that the bugs are continually flying to the groves—will operate against any remedy which may be tried at this time. The only remedy previously published we may quote from Mr. Hubbard:

As was long ago suggested by Mr. Glover, in his report above mentioned, the bugs may be attracted to small heaps of sugar-cane trash with which Paris green or some other poison should be mixed; or the bugs, when collected upon piles of cotton-seed in winter, may be destroyed by drenching them with boiling hot water. The experience of several cotton planters with this last method has shown it to be practicable, but to be effective it must be thoroughly carried out. As the eggs can not all be reached and destroyed by hot water, the operation needs to be repeated several times at such frequent intervals that the bugs are not allowed to reach maturity and deposit fresh eggs.

In the orange grove effective traps may be made with refuse oranges, orange peel, etc., and the bugs, when thus collected, may be destroyed with the kerosene washes used for Scale insects. The kerosene solutions will also be more effective than hot water in reaching and killing the eggs.

As Mr. Hubbard further states, the cultivation of cotton through the orange-growing district of Florida is for many other reasons likely to diminish rather than to increase, and with the abandonment of this cultivation we may expect the Red Bug to do less and less damage to oranges, if not to disappear entirely as an orange pest, unless (and this is not over likely to happen) it should breed extensively upon some wild plant.

CAN THE RED BUG BE USED AS A DYE?

In the old days of expensive dye substances it was thought from the brilliant red color of these bugs that they could be used for some such purpose. Accordingly Dr. Charles T. Jackson, of Boston, was sent a number of these bugs in 1858 from this Department (then a bureau of the Patent Office), and from his report, published in the Annual Report for that year, it appears that the whole substance of the insect could be converted into a rich orange-yellow dye which could be readily fixed upon woolens or silks by the alum-mordant liquor. He also found that an ochreous yellow-lake could be made from them by precipitating the coloring matter with gelatinous alumina.

A PARASITE OF THE SUPPOSED EGGS OF THE COTTON STAINER.

By L. O. HOWARD.

In the article just preceding this parasite is mentioned and at Fig. 50 is shown one of the eggs which was so transparent that the contained parasite could be quite plainly seen. Carefully removing the egg-shell the parasites were found to be adults and in such perfect condition—evidently just ready to issue—that the following description was drawn

up from them and the accompanying drawing prepared. There is some little doubt as to the length of the wings, for they were, as a matter of course, closely folded and not fully developed. The venation, however, could be easily observed. The only other species of the genus reared in this country is *H. leptocorisæ*, which Mr. Hubbard reared from the eggs of *Leptocorisa tipuloides*, a predaceous bug found commonly on the Orange in Florida.

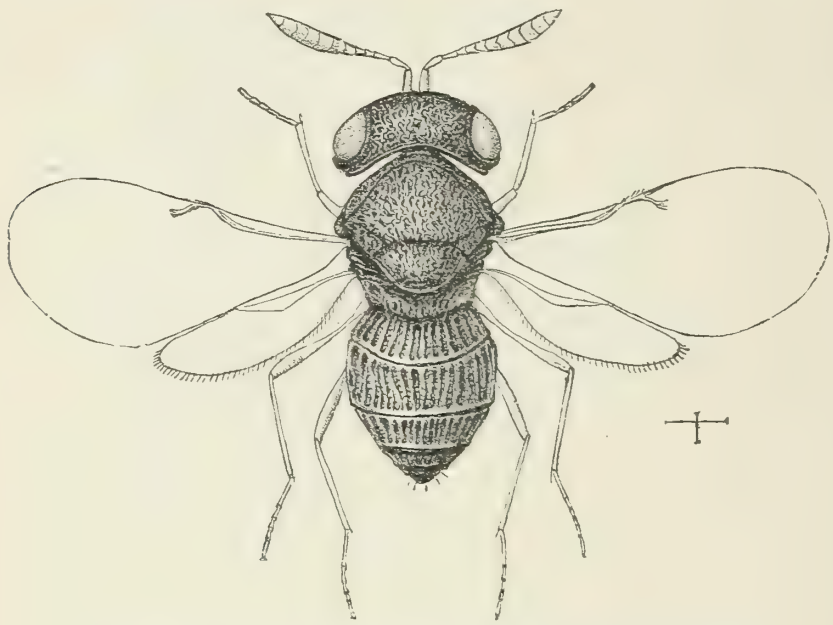


FIG. 53.—*Hadronotus rugosus* Howard—enlarged (original).

HADRONOTUS RUGOSUS sp. nov.

Female.—Length 1.8 mm. Expanse can not be measured, as the wings of the specimens examined have not expanded. Antennæ arise immediately above the mouth; scape reaches nearly to anterior ocellus; pedicel sub-cylindrical, as long as first funicle joint; funicle joints increasing regularly in width from joint 1 to basal joint of club; joint 1 of funicle twice as long as joint 2, the remaining joints sub-equal in length; joint 2 of club equal to joint 1; joint 3 longer than 2 and pointed. Head and face closely, deeply, and regularly punctate; facial impression shallow, with transverse punctures and with a distinct central longitudinal carina. Mesonotum strongly punctuate, the punctures of the scutum assuming a longitudinal direction. Dorsal surface of abdomen strongly longitudinally rugose, each joint smooth at extreme base and apex, the rugosities strongest upon joint 1, growing slightly fainter on succeeding joints; joints 2 longest, joints 1 and 3 slightly shorter; venter of abdomen with well-marked circular punctures. Entire surface of body with very sparse whitish pilosity. General color black; mouth parts, antennæ, and legs honey yellow, except that the front coxæ, antennal club and pedicel, and first two funicle joints above are brownish. The wings can not be well studied, but seem typical of the genus, and as in *H. leptocorisæ* Howard.

Described from 3 ♀ specimens (♂ unknown) dissected from eggs of Heteropteron, found on Orange by H. S. Williams, Rock Ledge, Fla., in April, 1880, and supposed by Professor Comstock to be those of *Dysdercus suturellus*.

INSECTICIDE APPLIANCES.

MODIFICATIONS OF THE RILEY OR CYCLONE NOZZLE.

By C. V. Riley.

We have for some time been at work on a Bulletin on Insecticides and Insecticide Appliances, in the preparation of which we have had the assistance of Mr. W. B. Alwood, who, as we announced in the last number, has accepted a position in the Virginia Agricultural Experiment Station at Blacksburgh. There is no certainty as to when this Bulletin will be published, and as we are informed that the condition of the printing fund will probably not justify its publication during this fiscal year we have decided to extract portions of it in advance for the pages of Insect Life. The inquiries which come to us for information upon the subject of the Cyclone or Eddy-chamber Nozzle, whether as to the principles of its construction or as to where it can be obtained, have induced us to take this up first, and in this article it will be our endeavor to give a clear and simple exposition of its features that will permit any good machinist to construct it.

It may not be amiss to emphasize the fact here that this invention is public property, being an outgrowth of our work for the Government, and that all patent claims involving the principle may be ignored by the public. Since the publication of our Fourth Report of the United States Entomological Commission some important modifications have been perfected, especially abroad, and it is to these that we desire to call more particular attention. While the terms "Cyclone" or "Eddy-chamber" apply to the whole class of nozzles constructed on the same principle, it has become necessary to designate some of the modifications by specific names. Usually they have been given the name of the individual who devised the modification, and, following this rule, the ordinary and original form which we have adopted in this country should be known as the "Riley Nozzle," by which term it is already exclusively known abroad and which it is desirable to adopt for the sake of clearness of statement.

THE TYPICAL RILEY NOZZLE.

As adopted for our work this form is illustrated at fig. 54, which shows the general appearance and detail of structure, with also an outline drawing of an angle-faced chamber.

At A is shown the typical small-stemmed nozzle with the screw-cap *c* above the chamber *a* as it appears when removed from the chamber. The circular body of this cap is chambered out inside and screws down to the bottom of the chamber *a*, the orifice *d* coming in juxtaposition with the orifice *e*, shown in the section at B, in

the wall of this chamber. These parts must meet accurately when lid is screwed down or the working of the nozzle is interfered with. To overcome this somewhat, a transverse slotted opening is sometimes made at *d*. Most of the French modifications make the cap to screw over the outside, but this necessarily increases the vertical depth of the chamber and considerably alters the character of the spray, tending to make it coarser, but at the same time to give it greater propulsive force in a direct line from the discharge orifice.

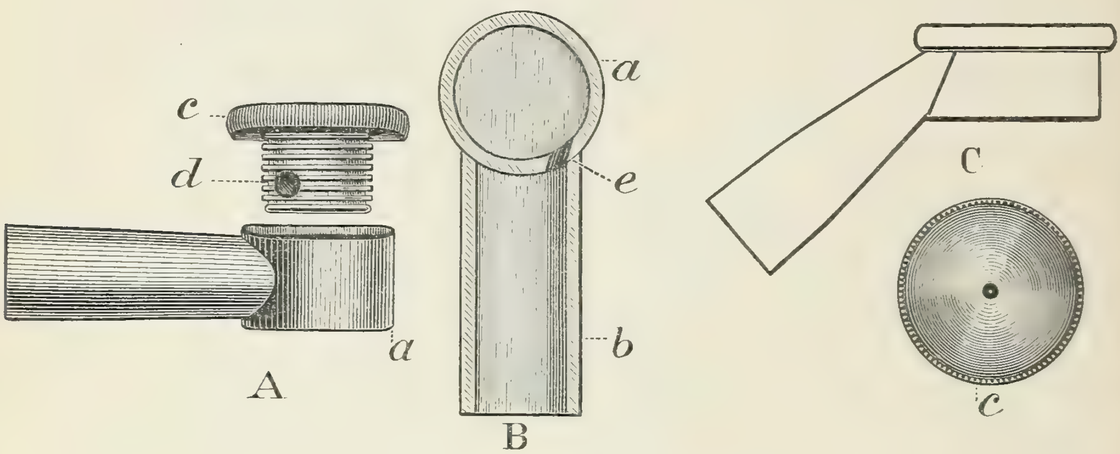


FIG. 54—The Riley or Cyclone nozzle.

For a fine mist of spreading spray the best results are obtained with a shallow chamber like the one shown. The face of the cap should be of fairly heavy metal, countersunk on the exterior surface, leaving but a thin plate of metal at the orifice of exit. The inner surface should never be countersunk around this orifice, as is often done by manufacturers. The section at B shows the construction of the stem and chamber and the tangential entrance orifice at the bottom of the chamber. At C is shown a view of the upper surface of the cap *c*, and also an outline drawing of a chamber placed at an angle of 45 degrees with the stem. This last is an important modification, especially when spraying overhead, as by slightly inclining the supporting-rod the spray can be delivered upward in a nearly vertical direction.

The size of the stem is merely a matter of convenience to suit the desire of the user. In the work of the Division this has been made of suitable size to insert in five-sixteenths or one-quarter-inch rubber tubing, as we found these the most convenient sizes of discharge-pipe to use. A wire wrapped tightly around the tube over the stem makes a perfectly tight joint and answers all purposes.

Of late, however, when it has become desirable to use the different sizes and styles of nozzles for the many and varied purposes to which spray machinery is now put, we have used a stem carrying a female screw of the size to fit a three-eighths-inch nipple. This nipple is made with a stem to insert in the size of the discharge pipe which it is designed to use, and a slight shoulder permits of more secure fastening

of the rubber by wire, which is very desirable to prevent disconnection when great force is used for finer sprays.

A discharge orifice of about one sixty-fourth inch (0.4^{mm}) is the proper size for producing a very fine spray, while for the coarser sprays one-sixteenth inch is commonly used. Between these two dimensions variable volume to suit most purposes will be obtained. For heavy suspension or clogging mixtures the orifice may be still larger.

The Riley nozzles are manufactured, under contract, for dealers by Thomas Somerville & Sons, proprietors of the National Brass Works, Washington, D. C., and by Woodin & Little, 509 and 511 Market street, San Francisco, Cal. The Nöel modification is manufactured by the firm of Nöel, Paris, France, and the Vermorel, by V. Vermorel, Villefranche, sur Rhône, France. In New Zealand it is manufactured and sold by Kutzner Brothers, brassmakers, Masterton, New Zealand. This firm advertise it as the "American Cyclone Nozzle" and make it single and in triplets.

MODIFICATIONS OF THE EDDY-CHAMBER SYSTEM OF NOZZLES IN THE UNITED STATES.

But one modification of sufficient importance to merit attention has appeared in this country, viz:

The Universal Spray-tip.—This nozzle is the invention of John Crofton and L. D. Green, of Walnut Grove, Cal., to whom we are indebted for samples and for an exhibition of its working while in San Francisco two years since. The illustration (Fig. 55) shows its general features.

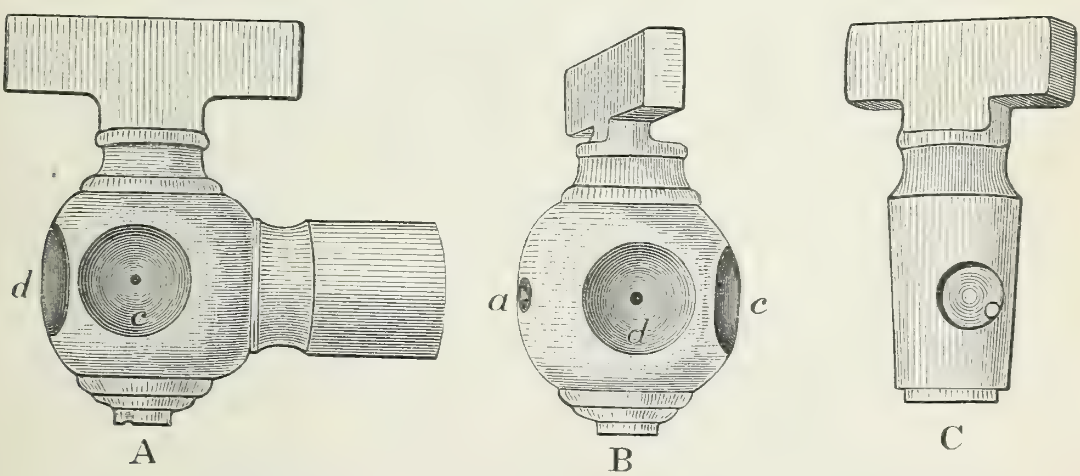


FIG. 55.—The Universal Spray-tip (original).

It is shown entire at A, and is in general form similiar to a water cock. The outer or distal end of the nozzle is shown at B and the plug at C. The spherical body of the nozzle has on its outer surface two countersunk depressions, *c* and *d*, and at the bottom of each is a small circular opening communicating with the orifice in which is inserted the plug C.

It has, also, a larger, straight orifice, *a*, which communicates with the center orifice.

The plug C has two cavities drilled into the body on adjacent quarters, and connected by a small orifice which passes from the shallower cavity tangentially into the base of the deeper one. This will be better understood by reference to Fig. 56, in which is shown a section through the center of the nozzle. This cut represents the water entering the shallow cavity in the body of the plug *b* passing through the cavity *e* and issuing at *c*. By turning the plug rightward, as indicated by the dotted line, the discharge can be delivered at *d*. Thus it discharges sidewise or straight ahead, at the will of the operator. By turning the plug leftward from the position shown in the cut, the discharge will be reversed and delivered at *a*, which is a larger straight orifice and permits the washing out of any sediment or obstruction. When turned half way around rightward from the position shown in the cut, the nozzle is closed.

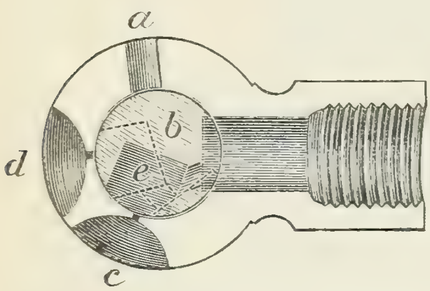


FIG. 56.—Section of Universal Spray-tip (original).

FOREIGN MODIFICATIONS OF THE RILEY NOZZLE.

Foreign modifications of the Riley nozzle are numerous, but mostly of slight practical value. Many of them, and especially the more important, were exhibited at the International Exposition and Conress held at Conegliano, Italy, March, 1886. As a matter of general information to American farmers and fruit-growers we quote freely from the report of Dr. V. Alpe on this exposition, made to the minister of agriculture, industry, and commerce of Italy, printed at Rome, 1887.

Doctor Alpe discusses principally the use of lime-water as a fungicide and the various nozzles by which it is applied; also the most important pumps, etc.

The following quotation (omitting some over complimentary allusions) is from pp. 34–35 of the report. Dr. Alpe has, in this, quoted largely from Professor Cettalini's paper on the exhibit:

One of the most important points in apparatus for the application of lime-water is that which relates to the atomizer.

The exhibitors at the exposition in Conegliano did not neglect this essential element, and although one can not say that there were presented any very important novelties or solutions of the problem, which were in every respect perfect, nevertheless there was no lack of interesting matter. The typical fundamental atomizer is that of Riley * * * brought to our notice some years since. The atomizers presented at our exhibitions were all more or less effective modifications of the Riley atomizer. As is well known, this consists of a cylindrical box, in bronze or other metal, of varying interior diameter, closed by an empty crystalline-lens-shaped stopper constructed

of the same metal, the center of the stopper having an aperture of 1.5 millimeters, slightly conical, with the base greater towards the exterior.

At the base of this cylindrical box there is an aperture whose axis is in the direction of a tangent to the concave surface of the cylinder. This aperture communicates with a pump by means of an India-rubber tube, which is the distributor. The liquid enters the cylinder with great velocity, there existing a great difference in diameter between the distributing tube and the receiving aperture. By the tangential position of this aperture the liquid is forced to whirl in the cylinder, assuming a rapid rotary motion. When the liquid has filled the cylinder it is forced to pass out by the upper aperture. The molecules of the liquid, continuing this rapid circular movement until the exit is reached, are thrown by centrifugal force first upon the surface of the conical aperture and afterwards into the outer air by combined forces of projecting and rotary motion. When the spirals have reached such a size as to overcome the molecular attraction of the liquid they are subdivided into minute particles forming a mist or spray of extreme fineness.

Dr. Alpe follows with a lengthy discussion as to the availability of the Riley nozzle for spraying lime-water, and concludes that from the nature of the small exit aperture they are not suited to this work.

Professor Scribner, while mycologist of this Department, found, however, that the Vermorel modification of the Riley nozzle (which will be spoken of at greater length further on) is the only nozzle he can use successfully in applying lime-water.

Continuing, Dr. Alpe speaks of the more important modifications of this nozzle which were shown at the exposition, as follows:

In truth, Vermorel, who now constructs the Riley atomizer in France, has endeavored to find a remedy by enlarging the aperture of exit as much as the peculiarities of the construction will admit.

From this it is easily imagined that various persons have thought of modifying the original apparatus of Riley, and among the most noted modifications and which deviate less from the primitive type, and which we saw at the exposition, are those of Ronfini, of Venturini, of Barnabe, of Savoia, of Professor Giordano, and of Nöel.

The first content themselves with slight modifications, while the latter introduce much more radical changes. Ronfini modified the Riley atomizer more in the form than in the essential parts, but Venturini has rendered it much better adapted to the use of hydrate of lime; not only enlarging the circumference, but at the same time furnishing the lower base with a regulator by means of which the jet may be made to bear a greater or less atomizing, according to necessity. Barnabe, instead of this, contrived to avoid the clogging of solid material by attaching a screw to the lower opening in such a manner that it can be opened and closed in an instant, causing the substance which impeded the regular functions of the apparatus to fall of itself, pushed by the liquid which continues to flow.

Savoia placed the air-chamber higher, and in the wall of the receiving-cylinder fixed four blades, which, arranged one above the other, forced the liquid, which rushed from a small lateral aperture, to strike successively from one to the other, revolving twice. More reasonable and better adapted to the apparent object is the Giordano atomizer. This, as usual, is formed of a chamber placed immediately above the place of exit for the liquid from the pump, which is furnished with a thin, movable plate of metal about half way up, having four apertures of sufficient extent placed at an angle of 45 degrees. The solution then strikes against the metal valve before mentioned, divides itself into four parts, and these four jets then reunite, striking one against the other, rush violently into the upper part of the apparatus, there

again uniting they escape to the exterior, forming a cone of liquid much more extended than that which can be obtained by the Riley atomizer.

We have long employed this, and have found it really good, naturally under such conditions as we shall see further on. [Pages 36–37 of report above mentioned.]

Dr. Alpe continues, quoting Professor Cettolini as to the various other styles of nozzles shown at the exposition, and concludes the discussion of nozzles by indorsing Professor Cettolini's views, that a simple rubber tip, which can be compressed and deflexed by a spring, so as to regulate the amount and direction of the spray, is superior, at least for spraying lime solutions, to the metal nozzles.

The more important modifications brought out in France and alluded to in the above extract may now be treated at greater length in connection with drawings of each.

The Nöel Nozzle.—The Nöel nozzle, as made by the firm of Nöel, Paris, is shown at Fig. 57. It is constructed on essentially the same principle as the Riley nozzle, except that the upper parts of the chamber and the discharge orifice are somewhat modified.

The circular chamber is abruptly widened at the top, making in fact a separate chamber of larger diameter superadded to the lower chamber. On the shoulder thus formed rests a circular disk, *d*, flat or slightly concave below, and which plays up and down between the shoulder and removable cap *c*, which closes the end of the upper chamber, a space of about three sixteenths of an inch. The center of this disk is pierced with an opening, as in the Riley, and the upper surface is built up around this orifice, both from its outer circumference and the edge of the central orifice, into a rim surrounding a conical depression in the

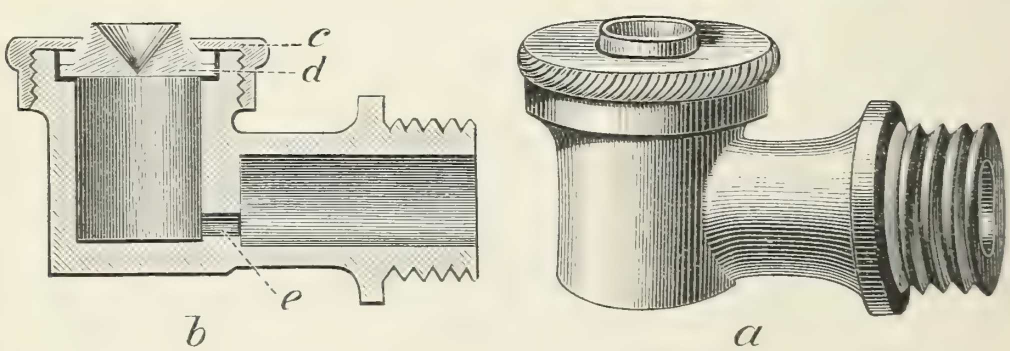


FIG. 57.—The Nöel nozzle (original).

center of the disk. This rim, when the valve-like disk is raised, protrudes through the face of the removable cap, and when lowered is nearly on a level with its outer surface.

The liquid on entering the chamber first issues from the central orifice, exactly as in the Riley type, and is diffused in a diverging cone-shaped spray, but the pressure of the whirling liquid rising into the upper chamber forces itself around the valve-like disk *d*, and depressing it, partially issues around the outer rim of the disk in a converging cone of spray, thus interfering with the discharge from the central orifice. It is claimed this tends to greater diffusion and admits of the

passage of a larger quantity of liquid. The nozzle is shown entire at *a*, and in section at *b*; *c* is the removable cap, *d* the movable disk in the upper chamber, and *e* the tangential inlet. This form of nozzle was commended by the judges at the exposition of which we have previously spoken, but in our practice we have found it much inferior to the standard Riley nozzle.

(*To be continued.*)

EARLY OCCURRENCE OF THE CHINCH BUG IN THE MISSISSIPPI VALLEY.

By S. A. Forbes.

The earliest record of the occurrence of the Chinch Bug in the valley of the Mississippi does not antedate 1840, at which time this insect had become sufficiently numerous in Tazewell County, on the Illinois River, to attract attention. I was consequently peculiarly interested by information received last winter from W. T. Shelby, Esq., a police magistrate and notary public of Olney, Ill., to the effect that he personally remembered the destruction of a field of corn in 1828, on his father's farm, opened up to cultivation about 1816, 7 miles north of Albion, the county seat of Edwards County.

Mr. Shelby has lately written me upon this point as follows:

> Chinch Bugs appeared in Edwards County, 7 miles north of Albion, in 1828, the year that Gen. Andrew Jackson was first elected President of the United States, and the Whigs, in derision of the Democrats or Jackson men, dubbed them Jackson bugs. I am not mistaken, as they almost destroyed a field of corn of my father's, the fodder from which the stock did not like to eat.

It is remarkable that an occurrence of such entomological interest should have escaped the knowledge of Thomas Say, living at that time at New Harmony, Ind., 25 miles away, and that his first specimen of the Chinch Bug should have been obtained three years later from the Atlantic coast.

Since the above was written Mr. Shelby writes again:

> I have lately had a conversation with Mr. Elijah Nelson, who made a farm in 1820, 2½ miles west of where Olney now is, and he informs me that Chinch Bugs appeared in the first crop of oats that was sown on that farm, as early as 1823, and that his father told him that these were the same kind of bugs that they had in old Virginia. Mr. Nelson also tells me that in 1832 they appeared in considerable numbers and did some damage to corn.

Inquiry in the vicinity of the much older settlements of Illinois—those along the Mississippi River above the mouth of the Kaskaskia—gives me no hint of the early occurrence of any of the great farm pests; but this is probably due to the fact that the first farms were opened there in the alluvial bottoms of the Mississippi and Kaskaskia Rivers, and that no prairie lands were cultivated for very many years after the settlements were established.

HEPIALUS ARGENTEOMACULATUS.

By D. S. KELLICOTT, Columbus, Ohio.

This beautiful moth, described by Harris, is known to occur over a rather wide range of the northern United States and Canada, and whilst it is rather uncommon in local collections it must be an abundant insect, at least in some localities; one of these is in Oswego County, N. Y., where I have found the larvæ and pupa-shells in great numbers. Its habits are quite in accordance with those of its congeners, so far as they are known. It bores the roots and stems of the Speckled or Hoary Alder, *Alnus incana.* I have been unable to study the larval habits, except in midsummer or in early spring, as it occurs in the section mentioned above. At the former season the imagos for the year have escaped. At the latter, the mature larvæ are in galleries, often reaching far up into the trunks, and the two broods, as I regard them, which are to mature in succeeding years are mostly in the under-ground portions.

The larvæ of Cossidæ and Ægeriidæ, which live in wood, appear to require more than one year to complete their growth. For example, that of *Cossus robiniæ* requires three years, as the following experiment indicates: July 1, 1882, eggs of this species were placed in a wound in the bark of *Robinia pseudacacia.* The tree selected was isolated and there were no signs that its trunk had been attacked by borers. A part of the eggs gave larvæ, the castings of which were observed from time to time at the place where the eggs were lodged. The latter part of June, 1885, a female pupa shell of the Cossid was found at the same place. Again I have shown, in a high degree of probability, that *Harmonia pini* exists as a borer for three years (*Ent. Americana*, I, 171). So this alder-boring species appears to pass a like period in the roots and stems. I have already referred to the different broods found in spring and summer. Again, I have had larvæ under observation in roots kept moist from July until the following May. They must have been nearly two years old, but did not transform. The failure of the original stumps, and the refusal of the larvæ to make homes in fresh ones, prevented further success.

The life history appears to be as follows: The eggs are laid the first week in June; the caterpillars live for two years in the roots; as the third year advances they work upward more or less into the stems; in the spring of the third year they bore out to the surface, partially or loosely plug the opening with chips, and transform; there does not appear to be a well marked pupa cell, and it travels rapidly up and down its tube for a long distance by means of the transverse abdominal teeth. Pupation occurs about May 1, and moths emerge a month later in the locality cited above. The pupa shells have been found protruding from trunks in a manner quite like those of other Cossids.

An account of the larva and the pupa was read by me at the Ann Arbor meeting (1885) of the Entomological Club of the A. A. A. S. This was printed in *Entomologica Americana*, I, p. 174, and the provisional name *Cossus alni* was proposed. It was not until June, 1888, that I obtained an imago, which proved to be *Hepialus argenteomaculatus.*

The descriptions were as follows:

Length, 1.5 to 1.8 inches. Subcylindrical, tapering very slightly at extremities; slender. Width of body, 0.25 of an inch. Length of smaller ones, 0.8 inch. The head is light yellowish-brown above, black about the mouth parts, hemispherical, smooth or slightly roughened, with a few dark dots, from which arise dark hairs, usually worn off the vertex of the larger examples. The second ring is smooth; lighter colored than the head. Above the spiracle, on either side, there are three black spots, situated at the corners of a right-angled triangle; the upper one, at the right angle, bears a coarse brown hair; the other two have finer, lighter-colored hairs. The top of the third ring is likewise smooth and brownish. The remaining body surface, except the yellowish piliferous spots and top of ring 13, is white. The longer hairs on the posterior rings are black. The body rings are strongly folded transversely. The yellowish dorsal spots bear brownish hairs; the anterior, larger pair are situated near together on the broadest transverse fold; the smaller, posterior pair are situated on a narrower fold, and much farther from the slight dorsal furrow. The stigmata are broadly elliptical; the rings narrow, black, scarcely raised above the surface; the color within the ring light brown. The legs are yellowish; hooks black; the proplegs with very many hooklets.

The pupa is slender, length 1.6 inches, width of thorax, 0.33 inch, but slightly curved and of unusually uniform diameter, smooth, under a lens transversely striate, the three anterior rings black, shagreened; on the prothorax there are two conical protuberances which in profile under a strong lens prove to be double pointed: on the clypeus are two gouge-shaped spines, shining black on outer half, and on the upper roughened base of each of these there is a small conical tooth; on the under side of the head case, below the gouge-like spines, is a pointed spine directed forward; back of this are two smaller cusps, one either side of ventral line, and still farther back, apparently over the first tarsal joint of the fore legs, are two smaller points. The transverse rows of dorso-abdominal teeth are as usual, but the teeth are exceedingly fine, increasing in size but little posteriorly; the black, blunt, anal segment bears several small black conical teeth on either side.

I have found no parasite of this larva, but I have seen that the woodpeckers are its deadly foes. In April, 1886, I had a favorable opportunity to search for the borer and was astonished at the scores removed by these birds. They often drill through a deep layer of wood; often two holes are made one above the other, the purpose being obvious. The morsel is evidently located, or its burrow rather, by sounding, as I noticed many instances in which a row of punctures surrounded the base of the alder. The destroyers are sometimes mistaken, for I found their drillings, evidently made in search of this larva, in sound wood in which there were no borers, but these were few compared with the successful trials.

Is it the activity of these birds that prevents the abundance in the forest of certain borers, *e. g.*, *Aegeria acerni*, whilst the same insect is often destructively abundant in the ornamental maples of cities and villages?

EXTRACTS FROM CORRESPONDENCE.

Late Autumnal Occurrence of Mites in Great Numbers.

Friday, November 7, was a rainy day, and at night a very heavy rain-fall occurred; on Saturday it rained in light showers, grew cooler in the evening and froze hard at night; on Sunday morning a lady riding along asked her husband what that curious sawdust-like stuff was that was scattered along the roadside so beautifully. On examination it was found to be a very small, red-legged, spider-like insect, and that it was everywhere—field, roadside, garden—covering the country for miles. I think it was not more than one-half as large as the tiniest new-born spider I ever saw, although I do not remember to have seen one just from the egg. They were more noticeable in pools and puddles of water—perhaps from their insignificance in size—where they appeared in patches, few or no individuals appearing singly.

Viewed through a microscope of low magnifying power they appeared to be shaped somewhat like a grand-father gray beard or daddy-long-legs; eight bright red legs dangled from their black bodies; occasionally a sort of drab-colored individual might be seen; two white opaque specks on either side, which I fancied might be eyes, adorned one end of the body and a very curiously-shaped dull-red spot the other; no appearance of any web was discernible; they were not at all active, and in about a week the legs began to turn white and drop off, probably because the insect was dead. As none were to be found on our farm after Sunday, and as I am a very busy woman, I had no time to study them. Being very much interested in them, however, I have ventured to write you, hoping that you will kindly tell me what you think about this strange insect, where they so mysteriously came from, and whether they will be likely to appear again, and, if so, will it be to our injury? * * * —[Augusta B. Wisner, Tecumseh, Lenawee County, Mich., November 27, 1888.]

REPLY.—Your letter of the 27th ult., giving an account of the occurrence of a small, red-legged, spider like insect in great numbers in your vicinity after a cold snap, has been received. I am very sorry that you did not save specimens, as I am not aware that anything precisely similar has before been recorded. Your description is quite careful, but you do not give us a definite idea as to size. * * * If you can possibly secure specimens, please do so and forward them to us.—[December 4, 1888.]

SECOND LETTER.—Your letter of December 4 duly received. In answer I will say that I have been so fortunate as to obtain a few specimens, which I shall this day mail to you. Although they have disappeared from our immediate vicinity, I find that at my brother's a great quantity of them remain, and they were observed one day last week crawling all over the buildings and even came into the house and got into the milk. I find this morning that many that I gathered for you must have escaped, but I hope enough are left for you to determine their nature. They were in a deep bottle, and I did not dream of their getting out. I have not changed the water from which I took them, fearing their health might suffer. In a letter from a sister living in Tuscola County, she says: "I have not seen the little insects you speak of, but others have here, or out of town. It does seem strange. Mysterious are the works of Providence." Now there is little doubt that it is the same insect, as I wrote her describing it; and as she lives at a distance of about 160 miles, you will see how widely spread it appears to be. * * *—[December 11, 1888.

REPLY.—Your letter of the 11th instant, accompanying a bottle containing specimens of the mite concerning which you had previously written us, has been received. I am very glad to get these specimens. The material is so rotten that it is difficult to study, but the species is evidently near the genus Tetranychus, which is the genus to which the common Red Spider of our greenhouses belongs. Concerning the habits of this particular species which you send I can say nothing, except that all of the species of the genus, so far as we know, feed upon the leaves of plants, and your species may have been very common on grass or low herbage.—[December 18, 1888.]

Balaninus nasicus in granulated Sugar.

I mail you a box of worms sent to us from Bucyrus, Ohio. They were taken from a barrel of granulated sugar that was lined with several layers of tissue paper. Can you tell us anything about them and how they probably came to be there? I imagine they came from the staves of the barrel, although that is hardly probable, as the wood is kiln-dried before being used for cooperage.—[F. N. Barrett, 143 Chambers Street, New York, November 26, 1888.

REPLY.—I have your letter of the 26th instant and the accompanying box of granulated sugar containing worms from Bucyrus, Ohio. These worms are not sugar-eaters, and their presence in the barrel described was accidental. They are the larvæ of the common Chestnut Weevil (*Balaninus nasicus*), and it is their habit to emerge from chestnuts and enter the ground to pupate. Chestnuts must have been stored or temporarily placed near this barrel of sugar (probably over it), and the grubs, in search of earth, made their way into it. They did not come from the wood, as you suggest.—[November 30, 1888.]

On Thalessa and Tremex—A Correction.

I continue to receive with much pleasure the successive numbers of INSECT LIFE, and in No. 6, to hand a few days ago, was specially interested in your admirable article on the habits of Thalessa and Tremex, and the beautiful illustrations which accompanied it. I must plead guilty to formerly having imbibed too trustfully the statements of well-known entomologists as to the oviposition of Thalessa, and to have thus been led to insert in my paper published in the Canadian Entomologist, Vol. XIV, p. 83, the statement that the egg was deposited in the larva. This was especially unfortunate, as the rest of the article was the result of personal observations. There appears, however, to be a clerical error in your paper on page 172, where I am coupled with Mr. Clarkson as an advocate of the larvæ being lignivorous. It is evident that Mr. Gade was intended for mention.

The description of *Heteropelma datanæ* enables me to place a name upon a species which has been in my cabinet for several years as *sp. nov.*? I have two specimens, both collected here.—[W. H. Harrington, Post-Office Department, Ottawa, Canada, January 7, 1889.

Sap-Beetles in injured Figs.

I send you by mail figs from the same tree showing several stages of injury from the insects. The figs are from a tree about four years old, growing in a sandy-loam soil made rich with stable manure and cotton seed. The piece of ground upon which stand the trees is about 65 by 75 feet and bordered on north and northeast by brick wall, east by brick house, and south and west by paling fence. The trees were somewhat severely bitten by cold last winter, but have borne a very heavy crop of fruit this summer. The brown insect begins to infest the fruit by entering the end furthermost from the limb as soon as the fig begins to mature and get ripe. You notice there are two kinds of the insect—one a brown, size of a weevil; the other almost microscopic, dove-colored. They destroy my entire crop of figs. What are they, and is there any remedy against their ravages? I have other kinds of figs, but they are not so bad on them.—[J. C. Richardson, Greenville, Ala., September, 1886.

REPLY.—* * * The numerous small insects which are found swarming in the figs sent by you represent several species of the Coleoterous family (*Nitidulidæ*), popularly known as Sap-beetles. The largest and most abundant species among them is *Carpophilus mutilatus*. Three other species, viz, *Colastus niger*, *Colastus truncatus*, and *Carpophilus marginatus*, were much less frequent. The small white larvæ of these beetles work also upon the figs. These Sap-beetles can not be considered as injurious, since they are not capable of puncturing the rind of their own accord, and they only enter such fruits as have been previously injured by some other insect. They feed upon the decaying pulp. Within the limits of the cotton belt the notorious Cotton-

worm Moth is well known to be greatly injurious to ripening fruit, especially to figs, by boring through the skin of the fruit with their probosces and sucking the juice. The Sap-beetles afterwards enter through the opening made by the moth, simply hastening the decay of the fruit. It is very probable that the injury to your figs has been caused in this way; and, if so, the only way to protect your trees will be to induce the neighboring cotton planters to poison the Cotton Worm.—[September 30, 1886.]

STEPS TOWARDS A REVISION OF CHAMBERS' INDEX* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[*Continued from page* 150.]

In addition to the species already known from North America (all of which will be included in the finally revised Index which is proposed to be published in portions as these papers proceed) I am now able to give descriptions of several new species from different localities and to add further notes to facilitate the recognition of already described forms. As each genus is dealt with the portion of the Index referring to it has been privately printed and each portion is therefore available for publication at any moment; but it has been thought advisable to hold it back until a more considerable section of the whole has been completed.

DEPRESSARIA Hw.

Depressaria togata sp. n.

Antennæ, purplish-fuscous.

Palpi, cinereous, speckled with fuscous externally on the second joint; apical joint entirely suffused with fuscous, with the exception of the extreme apex which is ochreous.

Head, dull grayish-ochreous; face paler.

Thorax, cinereous speckled, with fuscous.

Fore-wings, pale grayish-ochreous, thickly suffused and streaked with purplish-fuscous; the markings ill-defined, consisting of a dark fuscous patch at the base of the dorsal margin, a dash of the same color immediately above the middle of the wing at one-third from the base, followed by some pale grayish-ochreous scales; a pale grayish-ochreous spot on the middle of the wing at about the end of the cell is preceded and followed by fuscous scales, and beyond and above it are several fuscous dashes radiating outwards to the costal and to the upper half of the apical margin, where is a row of obscure fuscous spots preceding the somewhat paler and mottled cilia.

Hind-wings, pale shining whitish gray, with the cilia scarcely darker in which a slight tinge of grayish-ochreous is traceable.

Abdomen, grayish-ochreous.

Exp. al., 20^{mm}.

Habitat, Montana.

Type, ♂, *Mus. Wlsm.*

This species is distinguished by its very pale hind-wings, contrasting strongly with the dark fore-wings, which remind one much of the European *albipunctella*. The

* Index to the Described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv., IV (1), 1878.

neuration of the hind-wings as well as their color serves to separate it from that species; veins 3 and 4 of the hind-wings being from the same point, whereas in *albipunctella* they arise from a short stem.

This species belongs to the group in which veins 2 and 3 of the fore-wings are separate.

Depressaria cinereocostella Clem.=clausella Wlk.

Writing on this subject in the P. Z. S., 1881, p. 312, I mentioned that Clemens's paper in which it was described was published at some time during the month of March, 1864, and that the volume XXIX of Cat. Sp. Het. B. M. containing Walker's description of *clausella* was dated March 7, 1864. Some additional information, for which I am indebted to Mr. E. T. Cresson, of Philadelphia, and to Mr. Butler, of the British Museum, justifies me in giving precedence to Clemens's name, the volume of Walker's Catalogue having been submitted to the trustees of the British Museum before publication, on June 25, 1864, whereas Clemens's paper in the Proc. Ent. Soc. Phil., II, 422, was laid upon the table of the Entomological Society of Philadelphia on May 9, 1864, and had probably been issued to the subscribers some weeks before.

Depressaria solidaginis sp. n.

Antennæ, purplish-cinereous.

Palpi, cinereous, second joint roughly clothed, with a divided brush beneath; apical joint with an obscure fuscous ring near the base, a wider and more conspicuous one near the apex, and the extreme tip also fuscous.

Head, cinereous touched with reddish brown above; face whitish.

Thorax, purplish-cinereous, tufted posteriorly.

Fore-wings, cinereous, blotched and speckled with purplish fuscous, especially about the outer one-half of the cell and at the base of the dorsal margin; three small blackish dots at one-third from the base, the two upper on the disk, obliquely placed, and followed by some very pale cinereous scales, the third on the fold straight below the outer and lower one of the pair; slightly beyond the middle of the wing and in a direct line with the middle dot is a very pale cinereous spot surrounded with darker scales, the outer portion of the costal margin has four or five dark, purplish fuscous patches forming a continuation of the row of dots of the same color, five in number, which extend from the anal angle along the apical margin, the whole series being preceded by some ill-defined longitudinal dark fuscous streaks; three of these are connected with the costal spots, the other three do not reach the corresponding spots on the apical margin; cilia, grayish-cinereous, with a slight lilac lustre.

Hind-wings and cilia, pale grayish, with a faint lilac luster.

Abdomen, grayish-cinereous, clouded with fuscous posteriorly.

Exp. al., 22^{mm}.

Habitat, Kirkwood, Mo.

Larva on Solidago.

Type. ♂, *Mus. Wlsm.*

A single specimen received from Miss Murtfeldt in 1884, bred from *Solidago*.

This species belongs to the group in which veins 2 and 3 of the fore-wings arise from a common stem.

The larva of this species is probably that which is described by Coquillett (Pap. III, 97–8) under the name *pulvipennella* Clem., for I find that Professor Fernald named Mr. Coquillett's specimens, and has also identified specimens of this species for Miss Murtfeldt as *pulvipennella* Clem., which do not correspond with specimens of *pulvipennella* in my own collection that were compared with Clemens's type in the collection of the Entomological Society of Philadelphia.

Depressaria fernaldella sp. n.

Antennæ, dull cinereous, basal joint touched with tawny and fuscous scales.

Palpi, tawny-reddish beneath, above pale cinereous mottled and blotched with blackish scales on the second joint; a spot at the base, a broad ring above the middle and a minute spot at the apex of the terminal joint, also blackish.

Head, tawny-reddish; face and the clothed base of the haustellum pale cinereous.

Thorax, tawny-reddish, mixed with fuscous.

Fore-wings, tawny-red, speckled with blackish and pale cinereous scales; the costal portion of the wing above the cell from the base to beyond the middle is of a paler tawny-red than the remainder of the wing-surface, and is mottled with fuscous along the costa; before the middle are two small spots of raised fuscous scales, nearer to the costal than to the dorsal margin, the lower one being farther from the base than the upper and immediately followed by a streak of pale cinereous scales; some bright reddish scales lie between the two discal spots and on and about the fold; slightly beyond the middle is a conspicuous, roundish, pale cinereous spot, above and beyond which is a profuse sprinkling of pale cinereous, mingled with blackish-fuscous scales reaching to the costal margin but not to the apex; at the base of the dorsal margin is a small patch of pale cinereous the outer edge of which is straight; cilia greyish, sprinkled with reddish.

Hind-wings, pale cinereous.

Abdomen, pale cinereous with a slight ochreous tinge.

Legs, hind tibiæ mottled with grayish.

Exp. al., 23^{mm}

Habitat, Orono, Me.; Wisconsin.

Types, ♂ ♀, *Mus. Wlsm.*

I have received this species from Wisconsin, from the late H. K. Morrison, and also from Maine, from Professor Fernald, who was at one time disposed to regard it as *hilarella Z.*, from which, however, it is totally distinct. The species appears to be not very far remote from *hypericella*, but it is somewhat larger and paler.

I believe that the description of the supposed larva of *hilarella* (Coquillett, Pap. III, 98) really refers to this species, inasmuch as Fernald had sent specimens of this insect to several correspondents, myself among the number, under the name of Zeller's species, and had not the Zeller collection subsequently come into my possession I should probably have failed to recognize the mistake.

Depressaria parilella Tr., var. novo-mundi Wlsm.

In the P. Z. S. for 1881, pp. 317–18, I discussed the question of the identity of the North American *Depressaria*, for which I suggested the name *novo-mundi*, with *D. parilella* Tr., a well-known European form.

After re-examining a full series of specimens from both continents, I am not prepared to argue that those from Oregon or from the Eastern States should be regarded as anything more than local forms of *parilella*, especially as Zeller (Lin. Ent., IX, 283 *et seq.*) describes no less than five different varieties of the species known in Europe. The only points in which the American specimens differ from those in the Zeller collection are in the slight dusting of fuscous scales around the apical joint of the palpi and in the somewhat more elongate appearance of the fore-wings as well as in their darker color. This species should therefore be referred to as *D. parilella* Tr., var. *novo-mundi* Wlsm.

I am able to add another species to the record of European forms occurring on the west coast of North America. I have received from Mr. Walker three specimens undoubtedly referable to *D. ciniflonella* Z. These were beaten out of fir October, 1882,

at Esquimalt, Vancouver Island, and were probably specimens that were commencing to hibernate.

Depressaria lythrella sp. n.

Palpi, cinereous, dotted and mottled with purplish-fuscous scales, especially towards the apex of the second and third joints.

Antennæ, annulated widely with tawny, narrowly with fuscous scales.

Head and thorax, cinereous; the former striped along the middle; the latter speckled with purplish-fuscous.

Fore-wings, tawny-reddish, much dusted with fuscous and pale cinereous towards the costa; a pale cinereous basal-patch has a distinct spot on its lower half; before the middle of the wing is a conspicuous curved black spot, edged with reddish and followed by cinereous scales; a few cinereous scales are scattered across the wing on the outer third, parallel with the apical margin, along which runs a slender line of blackish scales; cilia purplish-gray.

Hind-wings and cilia, brownish-gray.

Abdomen, purplish-gray.

Posterior tibiæ of the same color as the hind-wings; tarsi, mottled with darker scales.

Exp. al., 15^{mm}.

Larva on *Lythrum alatum.*

Habitat, Illinois; received from Professor Forbes.

Appears to be allied to *impurella* Tr. and to the same group as *purpurea* Hw.

Depressaria gracilis sp. n.

Antennæ, brown.

Palpi, straw-colored, tinged externally on the second joint with brown, especially at its apex.

Head, pale reddish-brown; face, whitish-ochreous.

Thorax, reddish-brown.

Fore-wings, rather narrow, pale straw-color, with a short, dark brown basal patch, commencing on the costa but not reaching quite to the abdominal margin; two minute dots of brown scales on the disc before the middle, the upper one being nearer to the base than the lower; a small brown spot on the middle of the wing at the end of the cell, and a row of brown marginal spots almost connected, so as to form a marginal line, four on the apical and two on the costal margin; cilia whitish straw-color, tipped with brownish and having a strong line of brownish scales along their base; about the anal angle the cilia are paler than above it.

Hind-wings, very pale fawn-gray; cilia straw-white.

Abdomen, grayish.

Legs, pale straw-color, tinged with brown on the posterior tarsal joints.

Exp. al., 15^{mm}.

Habitat, Texas.

Type, ♂, Mus. Wlsm.

A single specimen received many years ago from Belfrage. It seems remarkable that this species should not have been known to Zeller or Clemens, who were both acquainted with the results of Belfrage's collecting. I have not been able to find any description of it, but if Chambers has by error placed it in the genus *Gelechia* it is yet possible that I may have overlooked it. It is a small and rather slender species with normal neuration, closely allied to the European *D. culcitella* HS.

PLUTELLA Schrk.

Plutella omissa sp. n.

Head, face, and antennæ, white; palpi slightly tinged with brownish at the sides.

Fore-wings, white, with a yellowish tinge, most noticeable along the fold, sometimes with a very few scattered brownish scales; the dorsal and apical margins and the anal angle are dotted with small groups of brown scales; cilia white.

Hind-wings, very pale grayish, iridescent, with a rosy hue; cilia paler.

Exp. al., 13^{mm}.

Habitat, Willow Creek, Oregon, September 9, 1871. Five specimens.

Type, ♂ ♀, *Mus. Wlsm.*

(*To be continued.*)

GENERAL NOTES.

NOTES ON THE COCHINEAL INSECT.

In October, 1886, we received from Mr. A. F. Carothers, Iuka Ranch, near Cotulla, La Salle County, Tex., a large number of specimens of the Cochineal Insect (*Coccus cacti*), and were much interested to find that they were being destroyed by a predaceous caterpillar, which worked in precisely the same way as *Dakruma coccidivora* upon the Cottony Maple scale, described by Professor Comstock in the annual report of this Department for 1879. The caterpillars ate one Coccid after another, spinning a silken tube as they progressed and remained hidden inside the tube, which was covered with fragments of the Coccus and of its white secretion. We were fortunately able to rear the adult, which proved to be beyond question identical with *Dakruma coccidivora*, this species having previously been found only in the District of Columbia.

Another enemy of the Cochineal Insect was reared from this same lot of specimens. This is a true parasitic fly of the genus *Leucopis*, species of which have previously been recorded as attacking scale insects. Specimens were sent to Dr. Williston who has kindly sent us the following description, as the species proves to be new:

Leucopis bellula, n. sp., Williston

Length $1\frac{3}{4}$–2^{mm}. Black, thickly grayish white dusted. Front with two slender, gently arcuate, black stripes; the narrow orbital space perceptibly more whitish. Antennæ black, the basal joints shimmering whitish; arista short. Face in color like the frontal orbits. Mesonotum with two conspicuous chocolate-brown stripes, beginning on the inner side of each humerus and gently converging to the posterior margin. In the middle of the dorsum, before the scutellum, there are two bristles; the usual bristles on the lateral margin, and on the margin of the scutellum; none on the front or vertex. Abdomen more whitish than the thorax; clothed with short black hairs; first segment with the lateral margins and a posterior band, deep brown; second third and fourth segments each with a slender, sub-interrupted stripe and a pair of rounded spots, all deep brown in color; the pair on the second mod-

erately large, on the third, smaller, and on the fourth, punctiform or minute. Legs black, with the same whitish pruinosity; the immediate tip of femora, the base of front and hind tibiæ, the middle tibiæ, and the tarsi, except their tip, yellow, the tibiæ elsewhere and the tip of the tarsi brown or infuscated; in some specimens, the tibiæ throughout are more brown. Wings hyaline, or faintly clouded; the auxiliary vein distinctly separated from the first longitudinal, except at tip; the last section of the fifth vein a little shorter than the penultimate one of the fourth.

Four specimens, from Professor Riley, labeled "Par. on *Coccus cacti.*"

I was, at first, in doubt as to the specific difference of this from *L. bella* Loew, from Cuba. Aside, however, from the different habitat, there are sufficient differences in coloration to indicate a well-marked variety, at all events. Loew describes his species as having "Antennae nigrae, albido-pollinosae," the second segment of the abdomen only, as bearing a "maculam rotundam atram," and "Alae lacteae" in color.

A species of Drosophila was also bred from the mass of Coccids, and this Dr. Williston determines as *Drosophila quinaria* Loew. This insect, however, is of course not a parasite.

We notice from the *Florida Dispatch* of August 6, 1888, that the Cochineal Insect has become very abundant upon Opuntias at Jessamine, Pasco County, Fla., on the authority of a communication from Walter N. Pike, of that place. The specimens were determined by Mr. Ashmead. The only previous record of the occurrence of this dye insect in Florida is that by Professor Comstock upon page 347 of the annual report of this Department for 1880. Professor Comstock's specimens were collected by Dr. R. S. Turner at Fort George, Fla., upon a yellow-flowering cactus, the species of which was not determined.

THE BEET CARRION-BEETLE.

A notice in the American Agriculturist for September, 1888, to the effect that the Beet Carrion-beetle (*Silpha opaca*) has been doing a great deal of damage to mangolds in England the past season, reminds us of the fact, to which attention has not lately been called, that this insect is also found commonly in this country, but that it has never here, so far as records go, been reported as injurious. Like other species of its family it feeds upon decaying animal and vegetable material. In England, however, it occasionally does great damage to the mangel-wurzel crop. It was first noticed to have this habit in 1844. The damage is done by the larva feeding upon the leaves.

AN AFRICAN LADY-BIRD INTRODUCED INTO NEW ZEALAND.

Through the kindness of Mr. Henry D. Twohy, of Auckland, we were some time ago favored with the following communication from the *Otago Witness* of February 3, 1888, which, through an oversight, had not been published. Mr. Twohy suggests that, if it seemed desirable, the same lady-birds could be shipped from Cape Town and landed in New York by way of London in twenty-six days, if the boats made close connection. Our Australian importations, however, are so promising at present that this experiment is hardly worth trying:

An interesting experiment is being conducted at Nelson in the way of acclimatization. It appears that some of the finest trees in and about Nelson have been de-

stroyed by the Wabble Blight or Australian Bug. Mr. Tinline, while at Cape Town, read there a pamphlet by Miss Ormerod, the entomologist, entitled "Notes on the Australian Bug (*I. purchasi*) in South Africa," which stated that the grubs of a coccinellid or lady-bird have been observed by Mr. Bairstow to do much good, by destroying the young Australian bugs just at hatching time within the sac of the female. Of these Mr. Bairstow says:

"The Coccinella is by far our best friend. It is proving a perfect godsend in destroying the perfect young *in nidus* of the female 'bug.' The larva buries itself in the gravid female and completely destroys her progeny, the dead carcass falling to the ground; and it eats the 'bug,' not only when it (the Coccinella) is young, but when it has developed to beetle condition." Mr. Tinline accordingly wrote to a friend in Cape Town asking him to procure some of the lady-birds, which he did, and one hundred and twenty of the little beetles were caught, put into a bottle with a good supply of the "bugs" to feed upon, and shipped on board of the *Tongariro.* On arrival in New Zealand (passage twenty to twenty-two days, steamer) it was found that by far the larger number of them were alive and healthy. A few were given to Mr. Maskell in Wellington, and the remainder brought on to Nelson. Mr. Maskell's advice was to select some small shrub infested with the blight, cover it carefully with muslin, and then turn the lady-birds into this cage. A young lemon tree, to which the bug is paying great attention, was selected in Mr. Sharp's garden for the purpose, and there the little colony of lady-birds is to all appearances thriving.

SUCCESSFUL SPRAYING WITH PARIS GREEN FOR CODLING MOTH.

Through the kindness of Mr. G. F. Kennan, of Rogers, Benton County, Ark., we learn that at the county fair, held from the 10th to the 13th of October, 1888, Mr. Ellis, of Bentonville, sent in the entire product, good and bad, of two Ben Davis apple trees, which he had treated with Paris green, and asked that they be examined by experts. This was done, and the investigation proved that not a single apple infested by Codling Moth could be found.

THE LEATHER BEETLE LITIGATION.

Those who read the article on the Leather Beetle or Toothed Dermestes (*Dermestes vulpinus* Fab.) in our Annual Report for 1886 (pages 258 to 264) will be interested, doubtless, to learn that the lawsuit between A. Einstein's Sons, of Savannah, and the Boston and Savannah Steam-ship Company, in which the former claimed damages for injury done by this beetle to boots, as alleged, from Boston to Savannah, has since been tried twice, and that both times the juries have failed to agree. The issue is still being fought, and it is not outside the bounds of possibility that some day a decision may be reached. The evidence at the final trial will be interesting reading to entomologists.

SPECIAL NOTES.

Poisonous Bites.—We would call especial attention to the long and interesting letter from Dr. E. R. Corson on spider bites, which we publish on page 280, and which is an important contribution to the discussion of the subject. Dr. Corson is an old acquaintance and a former collector of insects. He is a most reliable observer. We hope that our article in the January number will reach the eyes of other physicians, who will be able to add similar cases from their own practice. We also publish a letter from Mr. E. W. Allis bearing upon the same article, and may state in this connection that the views which he presents are practically those suggested by us in our article upon poisonous insects, published in Volume V of the Reference Handbook of the Medical Sciences (Philadelphia, 1887). We have stated upon page 741 of that volume that the effects of insect poisons depend in great measure upon the idiosyncracy of the individual and upon the state of health and constitution.

Cranberry Fungus Gall.—We also publish, under the head of "General Notes," an interesting communication from Dr. Fr. Thomas, of Ohrdruff, Germany, relative to the Cranberry Gall mentioned upon page 112 of the current volume of INSECT LIFE. Specimens of this gall were sent to Dr. Thomas, and his remarks are authoritative. The determination of the gall as of Phytoptus origin was made by our assistants during our absence in Europe, and while we should have been more cautious had we seen the specimens, the error is a very pardonable one, as the resemblance to many other Phytoptus galls is striking. This is one of the few instances where a fungus has been mistaken for insect work, while our mycological friends have often been caught napping in mistaking and even describing as of fungus origin structures due to insects.

The secondary Icerya Parasite.—At the time of our last writing we were in some little doubt as to whether the supposed secondary parasite of Icerya might not prove to be a primary parasite, or at all events a parasite upon something else than the very useful Lestophonus. But recent communications from Mr. Coquillett have deprived us of this hope. He writes under date of January 15: "I have just examined a number of puparia of the Lestophonus, and in two of them I found two of the Chalcids, one in each puparium. In one the Chalcid was dead, but the other was living, and I found it in a puparium that was entire, not having a hole in it by which the Chalcid entered; so there can be no doubt of the Chalcid having been developed in the inside of this puparium.' As yet none of these secondary parasites have been allowed to escape, and it is quite possible that by the great care which is being taken the Lestophonus may be introduced without its destructive enemy.

National Organization of Entomologists.—Our proposition in the January number of Insect Life concerning the formation of a national organization of economic entomologists, however favorably the idea may have been received, has not resulted in many expressions of opinion so far.

Prof. A. J. Cook, of the Michigan Agricultural College, writes:

> Your suggestion of annual meetings where entomologists may discuss insects and especially methods of work is most timely, and I hope will result in the organization. I should give any such project my hearty support.

Prof. Herbert Osborn, of the Agricultural College at Ames, Iowa, writes:

> Your suggestion regarding the national society of entomologists seems to me very timely. Only a few days ago the same subject was in my mind, and I believe an American Society for entomologists or an Entomologists' Union, on the basis of the Ornithologists' Union, or something similar, would be very advantageous to the cause of entomology.

A few other gentlemen have written in much the same terms, and we shall be glad to get not only such general opinions, but also definite suggestions.

We notice that several of the editorial or unsigned articles in Insect Life have been copied by other journals with individual credit, and we would therefore call particular attention to the notice which is always published upon the third page of the cover, to the effect that all editorial or unsigned articles, when personal credit is desired, should be attributed to the joint work of "Riley and Howard."

We are pleased to learn that through the liberality of Senator McMillan, of Michigan, the Michigan Agricultural College has been able to purchase the Fred Tepper collection of Lepidoptera.

INSECTICIDE APPLIANCES.

By C. V. Riley.

[*Continued from p. 249.*]

FOREIGN MODIFICATION OF THE RILEY NOZZLE (Continued).

The Vermorel Nozzle.—Another and perhaps the most important modification of the Riley nozzle is that of V. Vermorel, Villefranche (Rhône), France. It is well shown both entire and in section at fig. 58.

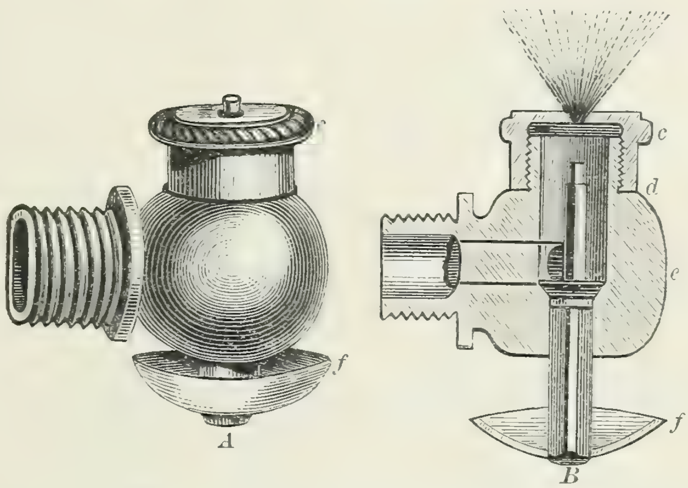


FIG. 58.—The Vermorel Nozzle—natural size (Original).

The important part of this nozzle is the disgorger, an attachment for removing obstructions from the discharge orifice. This is accomplished by perforating the bottom of the cylindrical chamber with a circular opening about half the diameter of the chamber. Into this is inserted from above a rod, which is circular terminally but preferably triangular below and fitting loosely in the orifice. This rod projects below the chamber so as to give movement enough to permit its distal end to be thrust through the opening in the removable cap, *c*. The part of the rod within the chamber consists of a seat which is ground to fit the bottom of the chamber when the rod is forced down by the water in action, as shown in the section, *B*, thus preventing the escape of liquid, an object which is further assured by fitting a rubber casket, *e*, on the lower surface of the seat. Above the seat the rod is cylindrical and of considerable size until near the end, *d*, where it is dressed to a diameter small enough to pass through the discharge orifice. The dimensions of the different parts of this rod must be governed by the size of the parts of the chamber.

When the discharge becomes obstructed the rod is pressed forward until the small end shown at *d* forces out the obstruction. The pressure once removed the rod falls back to its place. While the rod is pressed forward the water rushes out around it through the lower part of the chamber, thus completely washing out sediment of any kind. To prevent this outflow at the base of the chamber from falling upon the

operator a shallow concave cup, *f*, is fastened with a screw to the lower end of the rod. This deflects and throws the liquid forward. This device was added to the nozzle by Prof. F. L. Scribner, formerly Mycologist of this Department, and is an important addition, especially when spraying overhead.

This nozzle accomplishes the desired work equally as well as those without the disgorging or cleansing attachment, and the disgorger is a great convenience when spraying with solutions which are not clear. This is one of the most satisfactory nozzles for spraying lime solutions. The diameter of the discharge orifice is made much larger for using lime-water and the heavy suspension liquids which are used as fungicides than is necessary for ordinary insecticide preparations. If the orifice is too large the liquid passes out in a thin cone-shaped sheet and is not broken into fine spray.

As will be seen from the illustration, this nozzle can be screwed into the coupling at the end of the discharge pipe and used as a side discharge nozzle, or by using an elbow coupling the discharge may be direct from the distal end.

Recently M. Vermorel has altered the construction of this nozzle so as to make the eddy chamber adjustable on the stem, thus permitting the spray to be directed at any desired point within the circumference of a circle. Fig. 59 will help to illustrate how this is accomplished. This style is made in singles and doublets. The illustration gives the doublet. The chambers, *a* and *a′*, on either side are fitted into the stem *c* by short smooth nipples, *b* and *b′*, projecting out from the body of the chambers. They closely fit the circular opening through the head of the stem *c*, but permit the chambers to freely rotate around the axis of a line drawn through their base. From the center of the nipple of the chamber *a* a brass rod extends through the head of the stem *c* and through the base of the chamber *a′*, below the eddy chamber, and enters the thumb-screw, *f*. By loosening this thumb-screw the nozzles can be freely rotated and by tightening it it is firmly held in place at whatever angle desired.

In the cut the parts of the nozzle are shown separated, yet in a line occupying their relative positions in the perfect nozzle. Mounted in

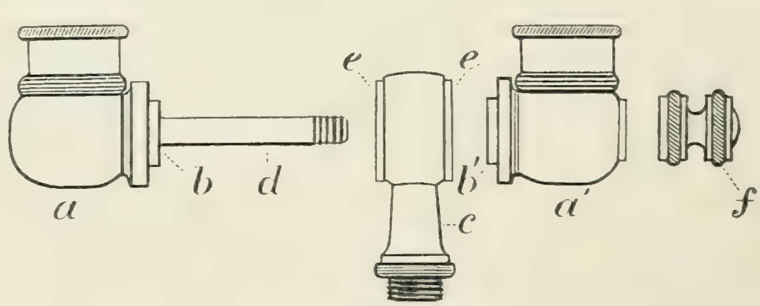


FIG. 59.—Improved Vermorel Nozzle—reduced about one-half (Original).

this manner only the chamber *a* can be fitted with a disgorger, as the rod which binds the chambers together would necessarily interfere with putting one into the chamber, *a′*.

The tangential entrance to the eddy-chamber is made from the face of the nipples, *b* and *b′*, and as these do not meet in the stem, rotating the chambers does not interfere with the flow of the liquid. This is a useful modification in the construction of this nozzle both from the fact that two nozzles are conveniently mounted on one discharge pipe, and that, being fitted on a rotating axis, the direction of the spray can be governed at will.

The Albrand Modification.—Mr. G. Albrand has constructed a Riley nozzle on the same principle as his modification of the Raveneau nozzle. Not satisfied with the Vermorel system of disgorging or clearing the nozzle from obstructions, he has constructed his with the cap attached to a thumb-lever held in place by a spring.

When the discharge orifice, which is situated in the removable cap, becomes obstructed, a pressure on the thumb-lever raises the cap and permits the liquid to rush out, carrying away any obstructions.

The cut (Fig. 60) illustrates this feature of the nozzle. The eddy-chamber is situated at the extremity of the stem, *b*; *c* is the cap and *a* the thumb-lever held in place by the spring beneath it.

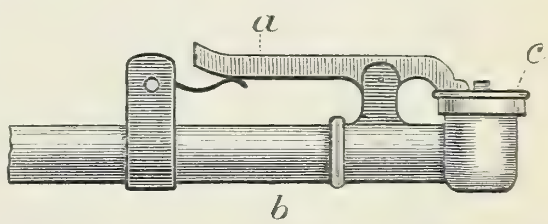


Fig. 60.—The Albrand Nozzle—reduced (Original).

The Japy Modification.—In this nozzle Japy has devised a degorger somewhat on the principle of the Vermorel, but which works in the opposite way (Fig. 61). In normal position the thumb-lever *a* is sufficiently raised by the spring placed between it and the tube *b* to throw the needle *c* down into the discharge orifice, thus closing it and preventing the passage of the liquid.

When the operator wishes to begin work he presses upon the lever as shown in the cut and immediately the spray issues from the eddy-chamber. If the discharge becomes clogged he releases the lever and the needle is thrown forward into the opening, thus clearing it. This is a convenient and simple plan of disgorging, and at the same time serves the purpose of a stop-cock or cut-off.

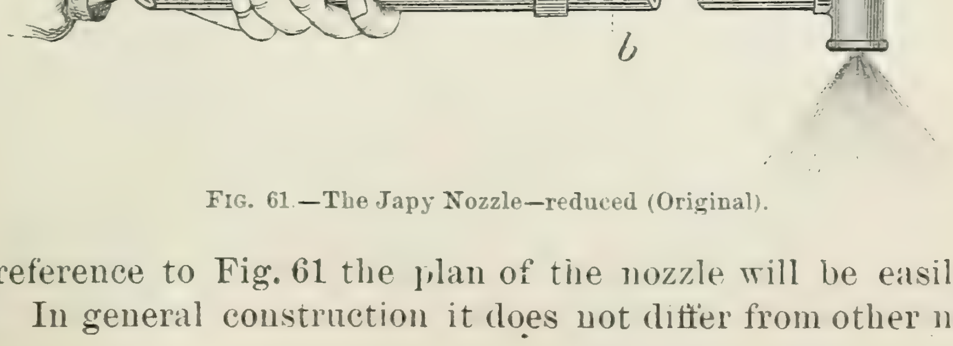


Fig. 61.—The Japy Nozzle—reduced (Original).

By reference to Fig. 61 the plan of the nozzle will be easily understood. In general construction it does not differ from other nozzles of

the eddy-chamber class, the details of which are fully given in other drawings.

The Marseilles Modification.—This novel modification of the Riley nozzle was recently brought out by a society known as the Future of Viticulture (l'Avenir Viticole) of Marseilles, France, and deserves attention as the most radical modification which has yet come into our possession as well as for its utility. In this the typical chamber has been so altered as to bear little resemblance to the original type. This is fully shown in the illustration (Fig. 62). The stem, *f*, is a brass tube which makes a screw connection with the discharge pipe at its proximal end, and has its distal end closed by a cap soldered on and bearing in its center the disgorging needle, *d*. Just below the closed end an orifice, *c*, communicates with the interior. This is cut tangentially in the side wall of the tube and is of considerable size. It is covered externally by a thin brass band fitted closely over the tube, but which does not quite complete the circumference. This is indicated in the drawing. This band can be adjusted about the tube so as to leave a greater or less opening at *c* as may be desired. When turned partially over the orifice, *c*, it reduces the opening to required dimensions and forces the issuing liquid to take a rotary motion about the stem, *f*, and to rise with such motion into the chamber shown immediately above. Below the band just mentioned is a thicker band, *g*, soldered around the tube. The lower edge of this forms a shoulder which meets the inward turned shoulder, *h*, of the outer jacket, and a rubber washer between completes the joint. The outer jacket extends beyond the end of the inner tube and forms a chamber covered by the removable screw-cap, *a*, which is pierced in the center with the discharge orifice *e*. The illustration shows one half of the outer jacket cut away. It slides readily upon the stem, *f*, so that to remove an obstruction the outer jacket only has to be drawn bodily downward when the needle, *d*, enters and clears the orifice. I have as yet had no opportunity to use this nozzle, but believe that a cord or wire can readily be used to draw the outer jacket down when it is out of reach of the hand. The pressure of the liquid immediately restores it to the normal position.

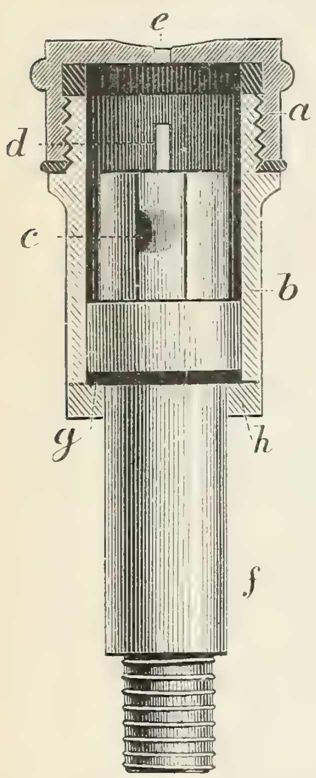


Fig. 62.—Construction of the Marseilles Nozzle—natural size (Original).

The New Zealand Triplet Modification.—The triplet cyclone manufactured by Kutzner Bros. of Masterton, New Zealand, is one of the practical foreign modifications of the Riley nozzle worthy of mention and illustration. The history of the introduction of the eddy-chamber system of nozzles into Australia and neighboring islands is told by Mr. Frazer S. Crawford of Adelaide, South Australia, in his paper treating of the Fusicladiums.

Mr. Crawford first learned of this system of nozzles though Mr. Hubbard's Report on Insects Affecting the Orange, sent him from the Department of Agriculture. He had several made which he used successfully in his orchards and gardens, but desiring a larger amount of spray than one nozzle furnished he combined them in doublets and triplets as desired, by branching the discharge pipe near the end and attaching a nozzle to each branch and holding all together by means of a clamp. This idea led to the development of the triplet shown in the cut, and is more fully set forth in the communication with which I will close this second paper.

When it came to the knowledge of the Division that the eddy-chamber system of nozzles was being successfully used in Australia, an order for specimen nozzles was sent to the makers above mentioned, as also the request that they furnish information about its introduction there, and the adoption of the peculiar form of triplet manufactured by them. This letter being published in a New Zealand paper, called forth the following response from Mr. Crawford, through which we learned the details of its introduction and development in that part of the world. That portion of the letter which relates to the matter under consideration is here given, as it is of considerable interest:

SURVEYOR-GENERAL'S OFFICE,
South Australia, June 11, 1888.

DEAR SIR:

* * * * * * *

(4) *Regarding the Riley Cyclone-nozzle.* By a New Zealand paper I perceive that you have ordered from Messrs. Kutzner Bros. of that colony a triplet cyclone-nozzle, as you are about to issue a bulletin on that very useful nozzle. The early history of the cyclone-nozzle in Australia you will find in my report on the Fusicladiums, etc. The original triplet as figured, being the first made in the Australian colonies, is the one I still use in my garden. This I lent to Mr. Dobbie of Gawler Place, Adelaide, who undertook to manufacture them on his own account, and he improved on mine by fixing the three nozzles to a central chamber, the top of which unscrews. These have been sold in New Zealand, Victoria, Tasmania, and New South Wales, one being purchased by Kutzner Bros., who wrote to me about it. * * * I regret to say that an enterprising Californian, a William Spawn, has been allowed to patent it in South Australia, although his patent is not worth anything because mine was made and publicly exhibited before he applied for the patent. He has also patented it in Victoria. The drawing accompanying his specifications was simply an enlargement of the drawing of the nozzle as figured in one of your reports.

I consider the cyclone type of nozzle as the greatest boon that orchardists have received, as without it it is quite impossible to spray a large orchard satisfactorily.

* * * * * * *

Yours, very faithfully,

FRAZER S. CRAWFORD.

Professor RILEY.

The arrangement of the triplet cyclone received from Messrs. Kutzner Bros. is shown in the following illustration (Fig. 63). The nipple, which is designed to enter five-sixteenths inch hose, is surmounted by a hemispherical chamber, *b*, which is covered with a milled-edge cap, *a*, which screws into the chamber, *b*. On this cap are mounted at the angles of of a triangle three Riley nozzles. The one to the rear stands higher than the others and delivers its spray straight in front, while the lower ones are respectively freed slightly to the right and left of a direct line. This arrangement secures a broad diverging cloud of spray and very much facilitates the work without in any way detracting from the quality of the spray as is the case when an attempt is made to increase the capacity by enlarging a single nozzle. A disgorger could be easily added to the chambers as here arranged, but as yet we believe no attempt has been made to do so. A screen of fine wire cloth is placed across the hemispherical chamber, thus rendering clogging almost impossible.

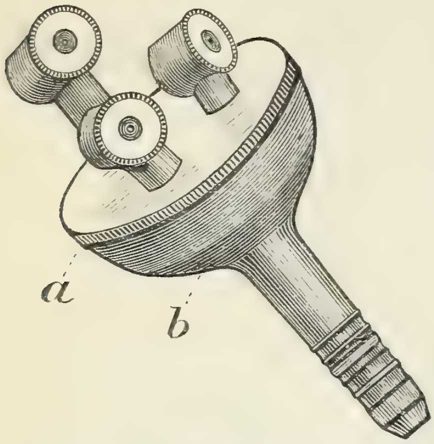


FIG. 63.—The New Zealand Triplet—reduced (Original).

THREE NEW PARASITES OF ICERYA.

By L. O. Howard.

Professor Riley has turned over to me for description three of the parasites reared by Mr. Coquillett, at Los Angeles, from the Fluted Scale (*Icerya purchasi*). These he has referred to by name in his annual report for 1888, and the accompanying figures are from the report. The necessity for condensation, however, rendered it desirable that this descriptive matter should be published elsewhere. Neither of the three species seems to be at all abundant.

THORON OPACUS, sp. nov.

Male.—Length, 0.84^{mm}; expanse, 1.2^{mm}; greatest width of fore wing, 0.163^{mm}; length of antenna, 0.6^{mm}. Joint 1 of funicle rather shorter and slightly narrower than pedicel; funicle joints distinctly separated, subequal in length, increasing very slightly in width from 4 to 9, joints 2 and 3 equal in width and slightly slenderer than either 1 or 4; club one-third longer than joint 9 of funicle, ovate, at base of same width as joint 9 of funicle, without a trace of dividing sutures. Metanotal spiracles large, oval: metascutellum with a straight median longitudinal furrow. Abdomen flattened, ovate, rather longer than thorax. General surface of the body with no visible punctation, opaque. Head, antennæ and thorax dark brown; abdomen rather lighter; all legs brown; tarsi nearly white; base of all tibiæ nearly white. Wings hyaline; veins slightly dusky.

Described from 1 ♂ specimen, rather poorly mounted in balsam, reared by D. W.

Coquillett, at Los Angeles, Cal., July 21, 1887, from adult female of *Icerya purchasi.* It was reared in a box containing only three or four of the scales, so there can be little doubt of its having lived at the expense of one of them. Mr. Coquillett reared another specimen August 29, 1887, but this I have not seen.

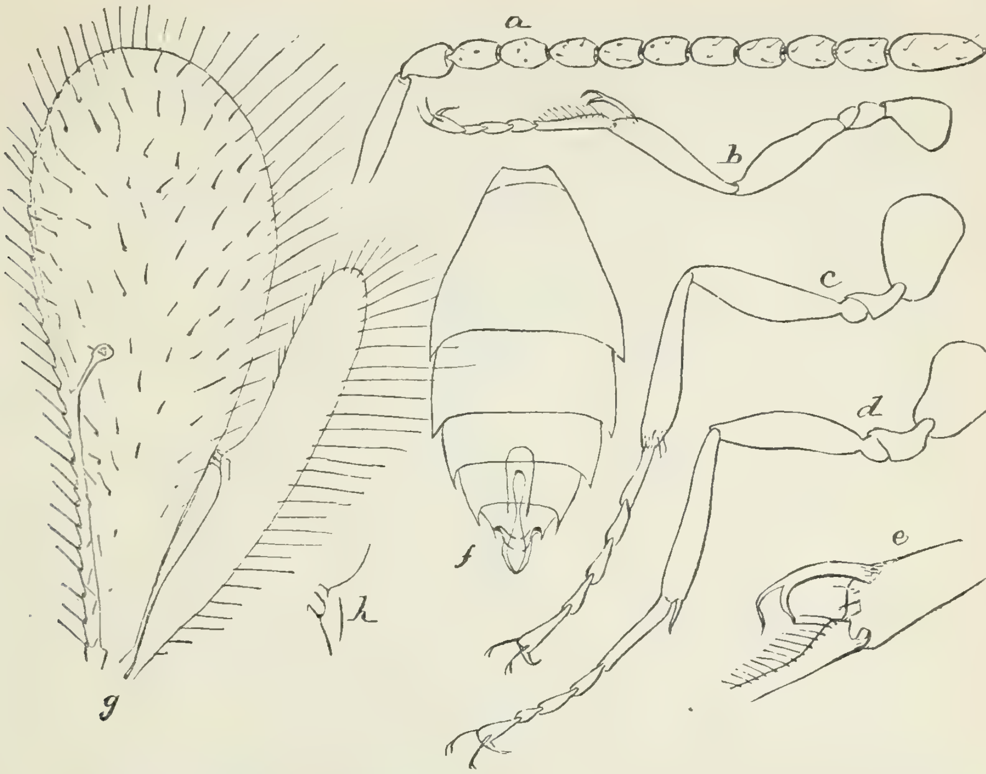


FIG. 64.—*Thoron opacus*, Howard: *a*, antenna; *b*, *c*, *d*, fore, middle, and hind legs; *e*, last tibial and first tarsal joints of fore leg; *f*, abdomen; *g*, wings; *h*, hooks of hind wing—all much enlarged (Original).

COCCOPHAGUS CALIFORNICUS, sp. nov.

Female.—Length, 1.4^{mm}; expanse, 2.1^{mm}; greatest width of fore wing, 0.39^{mm}. Abdomen broader than thorax and one-third longer. Pedicel and joints 2 and 3 of funicle subequal in length; joint 1 of funicle one-third longer. Eyes rather more plainly hairy than usual. General color dark brown, nearly black, no punctation visible. Mesoscutellum lighter in color than rest of thorax except at immediate base, its posterior edge with a narrow band of bright lemon-yellow, extending from one lateral angle around the curved border to the opposite lateral angle, of nearly equal width throughout, at its widest portion measuring .027^{mm}; all coxæ brown; all trochanters yellowish-white; all femora brown, yellow at tip, more yellow at tip of front femora, less at tip of middle, and still less at tip of posterior femora; front tibiæ light yellow, very slightly dusky; middle tibiæ entirely light yellow; hind tibiæ yellowish with a brownish shade near base; all tarsi yellowish-white, last joint

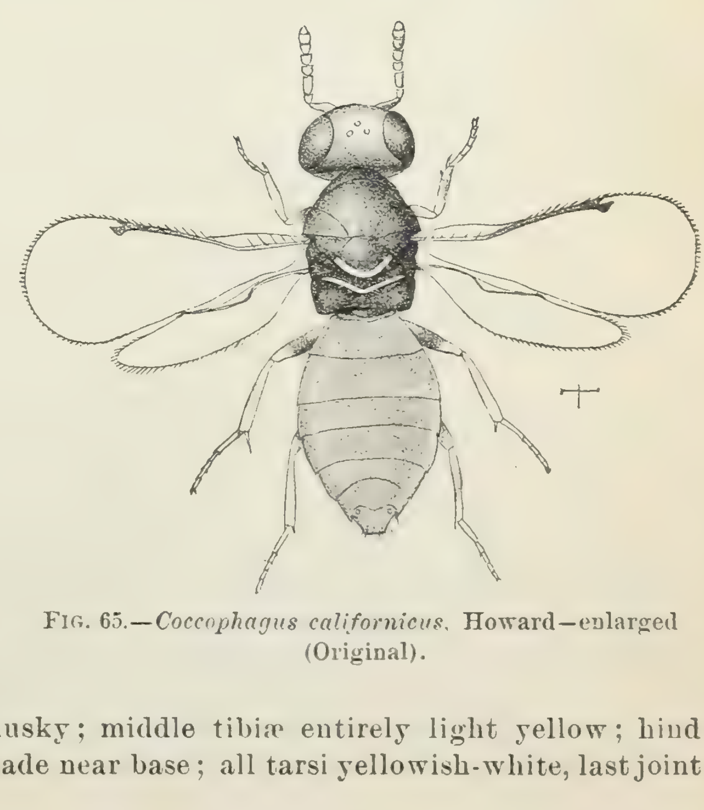


FIG. 65.—*Coccophagus californicus*, Howard—enlarged (Original).

dusky. Wings hyaline, veins light brown, distinct. Described from one female specimen reared from a female *Icerya purchasi* at Los Angeles, Cal., July 6, 1887, by Mr. D. W. Coquillett.

FIG. 66.—*Encyrtus dubius*, Howard—enlarged (Original).

ENCYRTUS DUBIUS, sp. nov.

Male.—Length, 1.2^{mm}; expanse, 2.2^{mm}; greatest width of fore wing, 0.37^{mm}. Scape of antennæ long, thin, cylindrical, together with bulla as long as first three funicle joints; pedicel short, conical; joint 1 of funicle longer than pedicel; joint 2 slightly shorter than joint 1; joints 2 to 6 subequal in length and width, each constricted at either extremity; club ovate, one-third longer than joint 6 of funicle, but not exceeding this in width; funicle and club with hairs at least as long as the joints themselves, but not arranged in regular whorls. Marginal vein of fore wings lacking; postmarginal equal in length to stigmal. Head, mesoscutum, and scapulæ very delicately shagreened; mesoscutellum with regular fine longitudinal ridges. Metanotal spiracles circular. Abdomen ovate, slightly longer than thorax, and equal to it in width. General color, brown, glistening; head and mesonotum with greenish metallic luster; antennæ and legs light brown, base of tibiæ whitish. Wings hyaline, veins brown.

Described from one ♂ reared from *Icerya purchasi* at Los Angeles, Cal., September 3, 1887, by D. W. Coquillett, issuing in a box which contained only adult females of the scale.

Differs in antennæ and sculpture of scutellum from any ♂ Encyrtus which I have seen. As the ♀ has not been reared, this may prove to belong to some allied genus, hence the specific name.

A CONTRIBUTION TO THE HISTORY OF THEOPHILA MANDARINA.

BY PHILIP WALKER.

Desiring about two years ago to obtain some information about the wild mulberry-feeding silk-worm of China, the *Theophila mandarina*, which had excited some attention in Europe, the Commissioner of Agriculture requested the Secretary of State to instruct the consul-general of the United States at Shanghai to examine into the matter and obtain sam-

ples of the cocoons and manufactured products, and if possible some of the eggs. In this the consul-general was successful, as the following correspondence shows.

The eggs were duly received at the Department, but failed to hatch. This is, we believe, the experience of European experimenters. The object of this importation was to obtain a vigorous race of mulberry-feeding worms, which might be interbred with our own depleted races and instil into them new life. The outcome was unfortunately unsuccessful.

UNITED STATES CONSULATE-GENERAL,
Shanghai, August 9, 1886.

SIR: Referring to the Department's instructions No. 7, inclosing a copy of a communication from the Commissioner of Agriculture to Mr. Bayard, relative to a certain race of silk-worms named therein, I have the honor to state that Shang-lin, a district in which a kind of wild worm makes its cocoon on the ordinary mulberry tree, is some 120 miles northwest of Shanghai, and to get there a long and, at this season of the year, tedious journey is necessary.

I have been informed that the gathering of this wild cocoon is carried on from the end of the sixth month to the beginning of the eighth (Chinese calendar), and it being now the middle of the seventh month, I have thought it advisable to instruct Mr. Emens, the interpreter of this consulate-general, to visit the district of Shang-lin as soon as possible and inform me of the result of his inquiries and procure the samples desired by the Commissioner of Agriculture.

The obstacles which will present themselves in making the inquiries in this matter will be increased if they are not made during the season, which will close two weeks hence.

It may be of interest to the Commissioner of Agriculture to know that this particular kind of cocoon, very little known to Chinese and still less by Americans and Europeans, is supposed to be a degenerate form of the ordinary silk-worm. Twenty to twenty-five years ago, when this section of China was devastated by rebels, the people of Shang-lin were compelled to flee from their homes at the season of the year when they were engaged in breeding their silk-worms. Being thus suddenly deprived of any care whatever the butterflies laid their eggs promiscuously, and in time this peculiar race of worms has developed, and it is said they are not to be found elsewhere in China.

The silk is of lighter weight than the ordinary product, and it may possess ordinary properties that Americans may develop to their profit.

I do not think it has received the attention of European cultivators of the silk-worm.

I have the honor to be, sir, your obedient servant,

J. D. KENNEDY,
Consul-General.

Hon. JAMES D. PORTER,
Assistant Secretary of State, Washington. D. C.

SHANGHAI, *August* 27, 1886.

SIR: In conformity with your verbal instructions to obtain for the United States Department of Agriculture a small quantity of the eggs of a race of mulberry-feeding silk-worms, scientifically known as the *Theophila mandarina*, and called by the natives Tien-seng-tsan, together with samples of the cocoons of this insect and of the silk spun from them, I have the honor to report that I left Shanghai on the 12th instant and proceeded to Shang-lin, a name applied to a village and the surrounding district situated in the northern part of Che-Kiang. It is a level, fertile region,

throughout which the mulberry is extensively cultivated. At the village of Shang-lin I could obtain no satisfactory information regarding the wild worm, as the natives termed it, and I therefore went a few miles into the country and finally reached a small village, where I saw the first crop of wild cocoons in the process of being spun.

I made inquiries respecting the eggs, but the people seemed totally ignorant of the matter, and I was repeatedly told that these worms came from heaven, which explains the term used in the letter of the Commissioner of Agriculture, Tien-seng-tsan, which, literally translated, is heaven-born silk-worm. Throughout a circuit of 20 miles this wild worm is met with. No attempt is made to propagate them. They take up their abode in the mulberry orchards from which the domestic worm is fed, and they are regarded by some of the farmers as a nuisance, while others in whose orchards they are numerous gather and dispose of the cocoons.

I could only learn of five places where the spinning of these cocoons is carried on.

I secured four samples of cloth, which I have marked Nos. 1, 2, 3, and 4. No. 1 is a crape used for women's turbans, for which I paid the retail price of 70 cents, Mexican. No. 2 is a kind of gauze, and is used in various ways; price, 40 cents. No. 3 is used for clothing; price, 52½ cents. No. 4 is made from the outside covering of the cocoon, from which a kind of down, used for wadding in quilts and winter clothing, is also made. Sample No. 5 is a lot of cocoons before being stripped, and No. 6 shows the appearance when ready for winding. Sample No. 7 shows the spun silk as taken from the reel.*

It will be observed that it is of a yellowish color and much coarser than the ordinary silk. I did not succeed in obtaining any of the eggs, the second crop being all hatched, but I made arrangements to have a quantity sent me as soon as the worms, which are now about twenty days old, have developed into moths. I expect they will arrive in Shanghai in the latter part of September. Eggs laid in the eighth moon hatch out so that the cocoons are ready to gather in the following sixth moon, forming the first crop. The second crop is gathered in the eighth, and no attention whatever is given at any time to the breeding or raising of these worms.

They must lay their eggs on the bark of the mulberry tree as well as the leaves, for in the autumn the leaves are all stripped from the trees and fed to sheep. Yet the crop is always about the same.

Attempts to cultivate them or to compel them to lay their eggs indoors will, I was informed, prove unsatisfactory. The moths will either escape or die. I was told that they never cross with the domestic worm. They feed upon the mulberry leaves exclusively. I made inquiries as to their origin, and was told that they had always existed throughout that section. Information that I had previously obtained in Shanghai to the effect that they are a degenerate type of the ordinary worm, caused by the advent of the rebels twenty-five years ago, was not corroborated by the answers to my questions on the subject. An old man of seventy, who was busy reeling silk, told me that he had known of them for over sixty years. The natives spoke of their hardiness and their indifference to rain, wind, or any of the conditions that seriously affect the domestic worm.

The majority of the natives of whom I made inquiries knew nothing of their habits. They gather the cocoons from the trees twice a year and regard them as a free gift from heaven.

I am, sir, your obedient servant,

W. S. EMENS,
Interpreter United States Consulate-General.

General J. D. KENNEDY,
Consul-General of the United States, Shanghai.

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* These samples are in the Department's silk museum.

NOTES ON THE CULTIVATION OF THE JAPANESE OAK-FEEDING SILK-WORM (Antherea yama-mai).

BY C. E. WEBSTER, M. D.

The subject of this paper is one that has engaged the attention of the writer through a period of several years, and affords many pleasant recollections.

The eggs of the Yama-mai are deposited singly or in small groups. Their tenacious brown envelope serves to fasten them to the spot when they are deposited, to occlude the minute pores which perforate the shell, thus controlling the evaporation of the contained fluids, and also as a disguise to conceal them from birds and other enemies, rendering them inconspicuous upon the rough twigs of the oak. In shape they are flattened spheroids, the greater diameter being 3^{mm} and the lesser 2^{mm}. They are deposited in the latter part of August. Those which are sterile begin to flatten out in a few days and finally collapse, while those that are fertile, if carefully opened by cutting off one face of the disk, will show the developing embryo.

The worm is fully formed long before cold weather sets in, and lies throughout the winter in a dormant state curled up within its neatly varnished case.

The eggs are commercially known as seed. I obtained my seed from Mr. W. V. Andrews, of New York, in the fall of 1872. He probably obtained the stock from England. Originally the species was brought from Japan by the French Acclimatization Society about the year 1860. The first stock was lost, and later a representative of the Dutch Government obtained a fresh supply, from which many crops were raised in different parts of Europe.

I placed the eggs in a bottle and hung them outside a north window. There they remained until the following spring. When warm weather came, fearing that they would hatch before their food-plant, the Oak, was in leaf, the bottle was lowered into a well and occasionally examined. All remained quiet until the middle of May, when there appeared three or four little caterpillars.

The Oak was not yet out. It is stated* that they will eat the leaves of the Chestnut, Quince, *Pyrus terminalis* and *P. aria* (species allied to the Mountain Ash) and also that they will eat the leaves of the Pear.†

The young worms were placed upon the pear leaves and ate vigorously, but this food brought on an attack of diarrhœa, a regular cholera infantum, from which they died, victims of circumstances and an unnatural diet. A few days later the little reddish, fuzzy oak leaves were out of bud, more caterpillars were crawling about in the bottle and the work of attending an interesting family of fifty began in good earnest.

* Der Japanische Eichenspinner. Von Ad. Ullerich.

† In Mr. Andrews' circular.

The eggs were emptied upon a piece of moist blotting paper, covered with glass and set in a warm place. A temperature of 60° F. is sufficient to hatch them. The moisture serves to soften the shell and varnish. The worm makes a perforation in the edge of the disk, and through this opening its head can be seen vigorously gnawing at the tough rind which imprisons it. Some larvæ* make a meal of their entire egg-shell, devouring what is left of it after they emerge, but these merely eat a hole large enough to crawl through. They hatch early in the morning and have the advantage in their natural state of a drink of dew before going to the leaves. For this reason it is best to give them water before placing them upon their food, or the twigs may be sprinkled with water. They should never be touched by inexperienced fingers, but may be lifted upon a soft brush. In handling them observe the fact that their tendency is to crawl upwards.

The length of the newly hatched worm is 7^{mm}. The general color is dark, and they are quite hairy. This appearance serves a useful purpose, rendering them less conspicuous upon the twigs of the oak, and much better protected from the sharp sight of insect-eating birds than if they presented the bright green color of their later stage.

The young worms when placed upon their food at once crawl to the end of the stem and attack the leaves. In their first period they are rather restless and disposed to wander, particularly if in a light place. In four or five days they attain the length of 14^{mm}.

The caterpillar then prepares to cast its skin. For this it is necessary that it should have a firm hold upon the twig, to secure which it crawls away to the end of the stem and covers the bark for a short space with a net-work of silk. Firmly grasping this fabric with its hinder pairs of legs for two or three days, it composes itself to sleep while internal changes are taking place. During this sleep it does not assume the ordinary position of rest. The fore part of the body is elevated and very much drawn together, a position characteristic of the larva of the Sphingidæ.

Molting insects should never be disturbed. This change involves a great strength, and sickly ones are unable to endure it. Those unfortunates who enter into the new period with portions of the old skin still attached to them are quite likely to die.

The newly molted worm looks pale and delicate. Its head, much increased in size, is of a creamy color, the body of a light green and sparely covered with thin hairs. The segments do not present the plump, rounded appearance that is characteristic of the condition just before the molt, but are angular. After a short rest it repairs to the ends of the twigs where the leaves, which are now quite large and of a glossy green, serve to relieve its hunger. The chief occupation of the worms during the period between the molts is eating, and as the amount eaten

* The Sphingidæ.

depends upon the size of the jaws, we see that an occasional change is necessary to meet the requirements of an increasing appetite. When reared under cover, the leaves must be occasionally sprinkled in order to supply the worm with drink.

In a short time after the first molt it becomes somewhat darker in color and in ten days prepares, as before, for the second molt. It has then reached a length of about 26^{mm}. At the twenty-first day it makes a third cast of the skin. Its length is 45^{mm}.

Just before the fourth molt, which occurs near the thirty-first day, it measures 70^{mm}. This is its final caterpillar skin. The head which was previously more or less tinted with red remains of a permanent green. The sides are adorned with metallic silver spots, and other less conspicuous markings.

The fully grown worm forty-seven days after hatching from the egg is of a length of 90^{mm} or 100^{mm}. It is then about to produce the cocoon.

The fully grown caterpillar wanders about the branches of the Oak evacuating from its bowels, not the hard dry pieces characteristic of its ordinary condition, but a soft semi-fluid matter which will mar any cocoon upon which it happens to fall. For this reason, as well as to avoid accidents consequent upon being disturbed, the twigs containing spinning insects should be removed from the neighborhood of those preparing to spin. The worm generally selects a spot where two leaves can be drawn together to afford a partial shelter. Between these leaves it ensconces itself.

The first silk thrown out is of a golden-green color. With this is covered the stems of the leaves, the twig from which they grow, and also their proximal surfaces. This silk forms a sort of scaffolding. It prevents the leaves, and with it the web, from falling off the tree, defines the space that the cocoon is to occupy and by its color serves as a disguise for the white material that is produced later. Having inclosed itself within this coarse structure the cocoon proper is made. Along the exposed space in the opening between the leaves is woven the first thick layer of silk. The head is moved rapidly back and forth across this surface leaving after it its sticky filament. The fiber is laid in loops as if by a flourish of the pen. The entire fabric is composed of a repetition of loops like flourishes.

Each cocoon, it is stated, consists of a single thread extending from the stem through intricate weavings till it ends upon the inner surface. This thread is from 800^{m} to $1,000^{m}$ in length and $.02\frac{1}{2}^{mm}$ to $.05^{mm}$ in thickness.

In a day or two the cocoon is completed. It is a regular oval about 50^{mm} by 25^{mm}. The exposed portions of the outer surface of a golden green, while the portions protected by the leaves are of a pale green. The interior is of a silvery white.

On the third day after commencing the spinning there is evacuated a milky-white secretion, which permeates the whole structure and in dry-

ing leaves it covered with a fine white dust. This secretion is supposed to correspond to the urine of higher animals.

At this time the caterpillar skin is cast for the last time. The head splits through the middle, the split extending down the back, and by repeated vermicular movements the creature forces the skin backward until it remains a conical button packed at the bottom of the cocoon. The pupa is at first a soft sticky thing, with rudimentary members similar to those of the fully-developed moth, excepting the wings and sexual organs, which are little developed. In a short time all of these structures become agglutinated together by drying, and although their outlines are still discernible, they can no longer be separated.

The pupal period is forty days.

Let us consider the mercantile value of the structure which this insect has made for its own protection. If the cocoon be placed in hot water and stirred about, various ends of the fiber which was broken in stripping off the leaves will be found floating. If these are caught upon some rough substance and drawn out of the water, they will unravel from the cocoon and soon end. By perseverance a fiber will be found which unravels indefinitely. In the practical application of this fact for the reeling of silk several cocoons are placed in the water together and their fibers joined to form a single thread.

The peculiarities of this silk are that the fiber is strong and loosely laid, therefore comparatively easy to reel, but it is coarser than the *Bombyx mori* silk and does not take a dye readily. The silks of the various American species are somewhat finer, of various shades of brown, and difficult to reel because of the compactness of the cocoon and the delicacy of the thread. I have, however, specimens of the Cecropia silk which was of such quality that it could be manipulated.

In gathering cocoons for silk they should be taken while fresh, as soon as the worm has completed its pupal change and before the weather has affected the quality of the fiber. The pupa may be killed by steaming and drying. The cocoons can then be packed and preserved for reeling. The Japanese prepare the *yama-mai* by killing them in the sun or baking them in ovens.

The first change occurs at about the fifth week after the spinning; the chrysalis skin bursts, and the moth emerges by emptying a fluid which softens the fiber and then breaking its way through the end of the cocoon. After about an hour the wings become expanded and the perfect insect is before us. The female is slightly larger than the male and of a more somber color. The males vary in tint from dark chocolate to bright yellow, while the female varies from brown to orange. The forewings are strongly curved along the costal margin and acutely angled at the tip. Each wing presents a transparent eye-like spot, in this respect resembling the Polyphemus and Luna. The vivid coloring and strongly-marked difference between the male and female serve to distinguish this species from *A. pernyi*, its Chinese congener.

During the first day the female is quiescent. After pairing the male flies away, while the female flutters among the branches and deposits her eggs. As reared in confinement, the eggs may be gathered from the sides of the boxes within which they are deposited. The ordinary yield of a single insect is two hundred.

The *yama-mai* is a native of a hilly country, and thrives better in similar localities. The Japanese raise them either upon scrub oaks or upon cut branches of the same placed in jars of water in open sheds. If raised upon the trees, scare-crows are placed in the tops to keep away the birds and paste spread about the trunk to catch the ants.

The species can readily be cultivated in this country. The only special precaution necessary is care in the wintering of the eggs, and, if reared in confinement, the selection of a locality free from mold, cool, with a free circulation of air, and not too dry, as this is the best for the growing worms; otherwise they are liable to an infectious disease, which destroys them just before the period of spinning. It might be possible to change the habit of this species so that it could be wintered in the cocoon, but it is probable that such a change would affect the quality of the silk. It appears to me more likely that the establishment of a cultivated stock of the American species, which should winter in the egg and produce a summer cocoon, thus resembling the *yama-mai* in habit, would afford a source from which a native staple might be reeled.

I am led to this conclusion by the observation that those cocoons of the Cecropia which when reelable contained dead worms, show conclusively that change by cultivation is necessary in order to utilize the native species.

The secret of success in silk culture is in knowing the nature of the insect, and failures regarding foreign species are due to an attempt to introduce, not adopt or naturalize, them. A purely native silk can be produced, and the cultivation of such a stock would be the best foundation for a silk industry. Understanding must be the parent of skill. Domestication of the native and acclimatization of foreign must precede the cultivation of a useful product.

NOTES ON A SPECIES OF BRYOBIA INFESTING DWELLINGS.

By F. M. Webster.

For the last two years, during spring, there have appeared in a number of residences in La Fayette, Ind., great numbers of small, active, brown mites, which, while apparently doing no harm, created much consternation among the painstaking housewives.

There are a number of species of Bryobia in this country, two of which (*B. pratensis* and *B. pallida*) were described by Mr. H. Garman as infesting meadows in Illinois,* but the present species appears to be undescribed.

*Fourteenth Report State Entomologist Ill, pp. 73 and 74.

On May 26 of the present year our attention was called to the swarms of these mites crawling on windows and over carpets and furniture in rooms, some of which were not accessible to sunshine, and had not been kept warm during winter. On June 7, we found the same species exceedingly abundant on the leaves of Timothy on the lawns in the vicinity of the infested dwellings. Those which we had observed indoors were seemingly fully developed, whereas those on the grass were of all sizes, the minute individuals predominating, and usually forming companies or families grouped about mature individuals. A month later however, there were comparatively few remaining on the grass, and they had long since disappeared from the dwellings. On July 29, I could find but a single individual after long search, this one being, as I suppose, full grown. From this date up to September 26, when they were again observed on Timothy, nothing could be found of them on the grasses or indoors. Wherever these mites occurred on the grass the latter soon began to have a scalded appearance. In fact, the prevailing opinion seems to be that the species of Bryobia, found in this country, are of vegetal food habits. This, if true, would indicate that they entered our dwellings for the purpose of hibernating; an idea which is somewhat strengthened by the fact that in some of the houses which they frequented there were no growing plants. Besides this, a species similar to the one observed by me was sent to Prof. A. J. Cook, from Scotts, Mich., by Mr. Adam Haas, on December 12, with the complaint that the window curtains and carpet on the south side of his parlor were full of them.* But, if their object were simply to secure protection from the cold weather, why should they stay so late in the spring?

This occurrence of mites in dwellings is not confined to Indiana and Michigan. In the *Country Gentleman* of June 9, 1881, a correspondent of Susquehanna County, Pa., complains of their occurring on kitchen windows and in a box of clothing in a seldom used chamber, the walls, floor, and furniture of the latter, in the corner near the box, being almost covered with the mites. In his reply Dr. Lintner states that the mites were allied to the red spider. In a private letter of July 9, 1881, Dr. Lintner writes me that under date of June 16 a correspondent complains of the occurrence, in great numbers, of mites in a newly lathed, plastered, and painted house.

In Europe the massing together of a similar species, *Petrobia lapidum*, during autumn, has been repeatedly observed. Dugés found whole families under stones in public walks in the south of France, he having in summer observed it in families on the under side of leaves of the Plane-tree.† What was supposed to be the same species has been several times reported as swarming under pebbles and gravel in England.

*Michigan Farmer, January 9, 1888.

†Economic Entomology. Aptera. By Andrew Murray, pp. 119, 120.

Mr. Albert Müller mentions its occurrence in great numbers in August, on the flint gravel, covering the approaches to Elmer's End Station, near London.*

CRANBERRY LEAF-GALLS.

By DR. FR. THOMAS, *Ohrdruff, Germany.*

The cranberry-galls mentioned in the periodical bulletin (INSECT LIFE, Vol. I, 1888, p. 112), looking like mite-galls of extremely small size, are *not* made by Phytoptus or any other animal parasite, but by a little unicellular fungus of the genus Synchytrium. The mite-galls of a similar form we find on other plants are purse-like and furnished with an opening, serving as a passage-way for the mites from the opposite surface of the leaf. Microscopical investigation shows the cranberry-galls as not purse-like, but chalice-shaped. On the bottom of the crimson chalice (at the base of the excavation) one cell is much increased in size, the "host cell" of the parasite. It contains only one subglobular fungus-cell, 0.086–0.171^{mm} in diameter, which has a brownish, smooth wall; its contents are colored by chrome-yellow oil. This "resting spore" of the fungus resembles that of *Synchytrium aureum* Schröter, known in Europe as growing upon a great many plants, in the United States on *Lysimachia quadrifolia* L. (cf. Farlow, Botanical Gazette, X, p. 242), but till now unknown or at least undescribed as a gall-maker of Vaccinium. I do not believe that the *Synchytrium vaccinii*, which produces the cranberry-galls, belongs to the former species, no chalice-shaped gall caused by *Synchytrium aureum* having been found yet.

In autumn the cranberry-galls become black and brittle and break off. The resting spores of the fungus fall down to the ground or are set free by the rotting away of the leaves. Next spring the spore germinates, produces (in a manner still to be stated for this species) zoöspores, swimming in water for some time and attaching themselves to epidermal cells of a young cranberry-leaf to re-commence the production of galls. Thus the parasite spreads by water, an infection that can not be limited in a locality in which water sometimes overflows all the ground or runs from one part to the other. A long flooding of the bog can not but result in the further distribution of the disease. The single remedy, I mean, would be to draw out all plants covered with galls in summer or autumn before the resting spores escape.

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* Entomologist's Monthly Magazine, 1867–'68, p. 71.

NOTE.—Early in December, 1888, Hon. L. B. Custer, of Logansport, Ind., applied to me for a remedy for a species of mite which had taken possession of a dwelling in his city, coming in through the crevices about the windows, as observed by the lady of the house, they having been also observed in the same house the preceding spring.—F. M. W.

It is possible that the same fungus infects other plants, too, and causes there small protuberances or galls on leaves and stalks, and therefore it would be desirable to state the occurrence of such small galls on other plants in the near neighborhood of the diseased cranberries.

EXTRACTS FROM CORRESPONDENCE.

The Red-legged Flea-beetle injuring Peach Orchards.

A peach enemy has sprung up among us that threatens the entire destruction of our orchards unless checked in some way. It is a small beetle, as per inclosed specimen. It partakes somewhat of the nature of the flea and potato-bug. When disturbed they jump rather than fly, and can be shaken off the trees, causing them to drop through the branches like shot. We propose to spray our trees with Paris green (1 pound to 100 gallons). Do you know the name of the insect we refer to, and is there anything better than Paris green for their destruction? Any information you may be able to give us will be thankfully received. [Stover & Stover, Edgemont, Md., May 15, 1888.

REPLY.—* * * The insect which is damaging your peach trees is the Red-legged Flea-beetle (*Haltica rufipes*). Your proposed application of Paris green will probably be satisfactory in destroying the beetles, but of course will not at once put a stop to the damage. Would it not be simpler to shake them down upon sheets placed upon the ground, first saturating the sheets with kerosene so that every beetle falling upon them will be killed? We shall be glad to learn of the success of whichever plan you adopt.—[May 17, 1888.]

The Spider Bite Question again.

I must thank you for sending me INSECT LIFE. While entomology is out of my line now, I usually see something of interest while looking over your journal. In the last number the article on "Fatal Spider Bites" has especially interested me, as I have had a curious experience in the same line, and it may interest you to have an account of it.

In medicine we frequently have rare cases come together. I have had six cases of spider bite, or so diagnosed, where the testimony is more or less convincing as to the venom of spiders

Four of them are rather remarkable, as the history is the same in all, and the symptoms very similar. A man comes home from his work, eats his supper, and goes out to the privy, sits on the hole, comes in contact with a spider's web, and almost immediately is bitten on the glans penis. But a few minutes pass by before there is giddiness and sharp lancinating pains running up into the back and abdomen. The patient is so sick that he goes to bed at once and sends for a physician; there is fever, intense restlessness, and anxiety; the abdominal muscles hard and contracted: the muscles of the face and throat strongly contracted, and swallowing very difficult; the patient appears to be in great agony, and calls for immediate relief; the arterial pressure is high, the pulse hard and rapid. In my first case, a negro about forty five years old, the symptoms were relieved by large doses of morphine subcutaneously, and the patient was up in three or four days. He had incipient phthisis at the time, and died from this disease a year later. There was no point on the glans penis to indicate the bite.

In my second case I was called out at midnight on the suburbs of the city to a mulatto, a large and vigorous man, whom I found in great agony, tossing all over

the bed, and crying out from the same lancinating pains running up into the abdomen and back, the muscles of the whole body strongly contracted, especially the abdominal; there was high fever, the body in a profuse perspiration, and the pulse hard and quick. He gave me much the same history. He had gone out to the privy after his supper, had sat on the hole, had felt the web, and almost immediately the bite on the glans penis, followed quickly by the agonizing pains, so that it was with great difficulty that he reached the house. I gave him large doses of morphia, hypodermatically, and plenty of whisky before he found any relief. This man was sick in bed three weeks; he had fever lasting several days, and some diarrhœa, and he got up much reduced in flesh, very weak, and his muscles all sore from the tetanic contractions.

A third case was that of a strong, muscular white man, who sent for me at midnight, after trying in vain various measures to relieve his violent pains in the stomach and back. He gave me precisely the same history as the other two. He went into his garden after supper to attend to his flowers, went into the privy, sat on the hole, felt the spider's web, and almost immediately the bite. For some minutes he felt no inconvenience; gradually the severe lancinating pains came on, shooting up into the abdomen and back, and they increased to such an extent that he sent for me. I found the same restlessness, anxiety, tetanic contractions, and agonizing pains as in the other cases. I found, moreover, on the glans penis the point of puncture. It was a bright red point, surrounded by a white zone, and an outer red areola, the entire spot measuring about two lines. The testicles were drawn up, and the abdominal muscles very tense and hard. Morphia and stimulants relieved the case, and the patient was out in two days.

The fourth case was that of a boy two years old. His nurse had set him on a privy seat which had not been used for some time, and he immediately complained of something biting him. When seen by me soon after, I found the prepuce very much swollen and edematous, but the child did not complain much. The swelling disappeared rapidly. The evidence in this case is very unsatisfactory, of course.

My fifth case was that of a colored woman, who gave a history of a spider dropping from the ceiling and biting her on the face as she lay in bed. There was a great deal of œdema and pain, and the patient suffered several days. I could find no distinct point of puncture, and the spider was not found.

In my sixth case a man in putting on his sock in the morning was bitten on the toe, giving him a great deal of pain. He was quickly relieved by morphine. He brought me the spider, which I immediately put in alcohol for future examination. Unfortunately, while away from the city, the specimen was lost. There was a red spot on the abdomen, and it resembled very much the female *Latrodectus mactans* figured in your journal.

I am sorry the evidence in these cases is not more direct, and that I can not produce the spiders. I made diligent search in each case, but the webs had been brushed away. While it may be questioned that these cases were spider bites, the collective evidence is in favor, I think, of that explanation. One thing is certain—sitting on old privy seats is not without its dangers, in this part of the country, at any rate. Scorpions are not to be found in Georgia, certainly not in this part of the State. I know of no species of ant capable of producing such a serious bite. We can throw out a bee or wasp sting. The symptoms all pointed to the introduction of a venom or animal alkaloid allied to *tetanine*. The evidence in four cases of sitting on a privy seat, of feeling the web, and immediately the bite, points strongly to the spider as the cause of the trouble.

The intensity of the symptoms in the second case, where the patient was a strong and vigorous man, would lead one to believe in the possibility of a fatal spider bite when the patient was feeble or especially sensitive to the venom of spiders. Of course, it is a mere conjecture as to the species of spider that caused the trouble in these cases. In the first three cases the symptoms were so similar as to suggest but one species. And yet it is not impossible that with spiders, as with the venomous

reptiles, the malignity of the bite may depend upon the condition of the animal at the time. With the rattlesnake, for instance, repeated use of his fangs will exhaust the supply of the poison, requiring some time for its reproduction, at which time the bite will be much less venomous.

I have written out for you my experience, thinking you may be able to make some use of it in your journal.—[E. R. Corson, M. D., 158 Jones street, Savannah, Ga., January 26, 1889.

REPLY.—Your long and interesting letter of January 26 has just come. The record of your spider-bite cases is extremely interesting, and we will publish it in a near number of INSECT LIFE just as sent, making perhaps a few comments. It is greatly to be regretted that in none of these cases was the spider seen or captured, and it is also a matter of regret that you lost the specimen of the one which you think was Latrodectus, and which was the biter in your sixth case. Your letter as a whole affords a very strong bit of cumulative evidence. In none of the outhouse cases is it probable that the Latrodectus could have been the biter, as the spiders of this genus do not live in such places. There are, however, two genera, viz, *Amaurobius* and *Cœlotes*, which do live in such buildings. Their species are rather large, active, ferocious spiders, which spin abundant webs. The very names of two of the species of *Amaurobius*, viz, *audax* and *ferox*, indicate the character of the spiders. There are other spiders found in these places, viz, the genera *Tegenaria*, *Pholcus*, *Dictyna*, and *Theridium*. The first, however, is probably not the one. The second is too weak, and the third is too small, and the fourth is too shy. It seems to me that the circumstances under which the bites were given in the first four cases are peculiarly favorable, as the parts injured were those which broke the web and which were most exposed and which, at the same time, are perhaps the tenderest parts of the body, being filled with blood-vessels and nerves. It is truly remarkable that all of these cases should have occurred in your practice so nearly together. I suppose that you have not placed them on record before or you would have given us the references. If any similar cases occur again in your practice or in the experience of any of your medical friends I hope that you will not fail to try to secure the perpetrator of the injury.—[January 30, 1889.]

Susceptibility to Insect Poison.

Allow me to refer to INSECT LIFE, No. 7, page 204, instancing the cases of reputed poisoning by *Latrodectus mactans*, where unsuspecting persons had been bitten, resulting fatally, while so many others have been bitten without being seriously injured, and scientific and medical men have often caused it to bite them to test its power for harm The sting of the honey-bee is not usually considered serious, but an exception came directly under my observation. During the afternoon of July 12, 1887, I removed some sections of honey from a colony of bees, and as the basswood (or linden) season was nearly finished they had but little to do but to seek revenge. At 6 a. m. the next day as my mother stepped outside the door she was stung upon the temple by an irate bee, while at a distance from the hive of about 100 feet. At 6.30 she was taken with a fainting fit, somewhat spasmodic in its action, which was followed by six others during the next hour and a half. A reclining posture and a dash of cold water into the face would soon restore consciousness. She continually insisted upon sitting up and that she "was better now," until at 8 o'clock, when the worst symptoms began to wear away. The sting had not been removed at first and was not readily found, as there was scarce any swelling or angry blotches in one place more than another to be seen upon the face, and the wound itself seemed very slight. The extremities were swollen and blotched, accompanied by a sensation as of nettles, and very painful, apparently the effect of the virus being suffused throughout the entire system, whereas, when stung, the most of it (the virus) usually appears to linger in the flesh round about the wound, and often causes considerable swelling in the vicinity.

The sting of the wasp, hornet, and bumble-bee is no less virulent, and cases are claimed where healthy men have died from the sting of an individual of each of the above-named insects.

In such cases, were the stings to be removed immediately without pinching the large end which contains the poison sac, thereby charging the wound with poison, and as much of the virus as possible removed from the wound by suction or otherwise, and an alkali, as soda or ammonia water, applied, it hardly seems as if there could be much trouble, unless the poison were to get into the circulation in sufficient quantity almost immediately, which is hardly to be expected. Such occasional circumstances ought not to deter us from keeping bees, but should rather incite us to study nature's laws, lest a single stray bee work much harm; and in case of both bee and spider it seems that not one case in one hundred thousand proves fatal. Indeed, may it not be a fact that radical poisoning and death, caused by these smaller insects of their special orders, have only occurred where the virus was introduced directly into the circulation, either through vein or artery? I am not aware that *L. mactans* is found in Michigan. Have never seen it here. The question whether it has been examined for any glands that may produce a virus and place it in a wound made by the mandibles suggests itself. Also, if such virus has been found, whether its nature be acid or alkaline.

Some points regarding the reported effects of the poison of *L. mactans* may be worthy of note. When once in the system of the man (mentioned by Mr. Dick) who was bitten but did not die, it seemed to remain in the system much as does the venom of the rattlesnake. The formic acid from the bee-sting loses its integrity in a day or two. Its action is quick and decided, but not lasting. The effects of prussic acid upon insects in the "cyanide bottle" are very similar. They very soon succumb to its effects, but even when in a state of lethargy, if placed in the open air, often revive and are soon as well as ever.—[E. W. Allis, Adrian, Mich., February 9, 1889.

The Hay Worm in Kentucky.

Please tell me what is the matter with the hay? The accompanying sample was cut and ricked in the meadow in the summer of 1887, and remained there till a few days ago. When hauling it in, after the hay was unloaded from the wagon, there were great quantities of the large, brown, seed-like bodies all over the rack, among which were little worms and bugs. Are the brown pellets the manure from the worms and bugs? You will observe that the heads of the timothy hay appear to have been eaten out in hollows. In the box I send you are also quantities of the brown substance and worms, just as appeared on the hay frame. —[James F. Askew, Georgetown, Ky., November 26, 1888.

REPLY.—* * * The insect in question is the common Hay Worm (*Asopia costalis*), usually found in clover hay and the life-history of which was first given by me in the *Prairie Farmer* (April 20, 1867), and subsequently more fully in the Sixth Report on the Insects of Missouri. The small round pellets are the excrementia of the caterpillars. This insect is a difficult one to fight, and our only way to defeat its attack is to adopt certain preventive measures. After the haymow is once thoroughly infested, it is almost impossible to destroy the worms without rendering the hay unfit for use. The worm feeds solely upon dried hay, and during summer they are confined to such unfed hay as remains over from the previous year's making; therefore new hay should never be stacked in contact with old. Of course it would be desirable to clean up the barn before putting in the new crop. Salting the hay, especially the 2 or 3 feet near the bottom, is a good practice. Its occurrence upon timothy hay is rather remarkable; for, as before stated, it greatly prefers clover, and, in consequence, will you not kindly inform us whether this particular hay was not stowed near some last year's clover, or upon a spot where clover had been?—[November 30, 1888.]

SECOND LETTER.—In reply to yours of the 30th ult. in relation to the Hay Worm, I will say that there was no clover stacked near the timothy hay, nor had there ever been. The hay will inspect pure timothy, although there is a stalk of red clover scattered here and there in the meadow. I have fed attacked hay to all kinds of stock and have seen no ill results.—[December 22, 1888.

A Rose-bud Cecidomyia.

I take the liberty of forwarding to you for inspection an insect which has made its appearance in a neighbor's rose-houses, and completely destroys all his buds. You will find, on close inspection, a little maggot-like worm close under the bud in all the young shoots I send you. As it is not known to me or any other rose grower I have shown it to, I would like to hear your opinion of it, if not asking too much. Also if you know anything in the way of remedies for it.—[Ernst Asmus, West Hoboken, N. J., September 29, 1886.

REPLY.—* * * This injury appears to be, so far as I know, entirely unprecedented. The insect is the larva of one of the gall midges of the genus Cecidomyia, but no insect of this kind has ever been recorded as feeding in this manner. It therefore becomes of great interest and importance to work this insect up thoroughly, and as a preliminary step I would urge you to send at once to the Department as many of the injured buds with the larvæ as you can find. In addition to this, it would be a good plan to cover with gauze one of the plants, so as to catch the little midge when it issues from the ground.—[October 1, 1886.]

SECOND LETTER.—* * * The maggot Cecidomyia has made its appearance in two different florists' establishments this fall in my neighborhood, if I have been rightly informed, in both cases having destroyed the whole crop [of roses]. They seem to appear in the fall only, as I have not heard of any later. * * *—[January 18, 1889.

Beetles infesting Yeast Cakes.

I send in this mail a box of yeast cakes that are infested. Will you kindly send me the name or names of the animals? They appear in the boxes of yeast during the months of August and September, and do not trouble us much at any other time. The boxes in which they are put up are covered with a paper label, seemingly in such a way that no insect could get in. Is it possible that the egg is hatched in the meal, and that the insect develops in the yeast? Apparently the only way to get rid of them is to prevent their developing in the boxes. Can you suggest any preventive that might be placed in the box which would make a part of the composition of the box itself? The boxes used are like the one I send you. Could oil of cedar be used? * * * In the process of making the meal is raised to about 90° F. Would this kill the eggs?—[W. K. Higley, College of Pharmacy, Chicago, Ill., October 4, 1888.

REPLY.—* * * Your yeast cakes were infested by *Silvanus surinamensis* and *Læmophlœus pusillus*, two insects which are very general feeders and very common in drug stores, feeding upon all sorts of medicinal roots, barks, herbs, and powders. Both species also feed upon meal and flour. The box which you sent was not at all tight, and it would be very easy for the beetles to work their way under the cover. If the label is securely pasted on and completely encircles the box the insects can not enter without piercing the paper, which they will not be apt to do. If the eggs or any young larvæ were contained in the meal they would probably not be destroyed by a heat of 90° F. An easy way to kill them would be to subject them before use to a heat of 110°, and then the only protection necessary after this course is taken will be to pay particular attention to and secure gumming of the label around the edges of the cover. * * *—[October 7, 1886.

Mites in Flaxseed.

I inclose sample mites taken from flaxseed that has been stored since last fall. Will you kindly tell me what these turn to, and if they will die out when cold weather comes? Will you say at the same time if they cause any damage to the seed, either in appearance or shrinkage in weights? * * *—[Albert Dickinson, 115 Kinzie street, Chicago, Ill., September 16, 1886.

REPLY.—* * * The seed has been infested by the mite known as *Tryoglyphus siro*, but there is also another mite present which is predaceous in its habits, and which is killing off the original mites in great numbers. This predaceous mite is *Cheyletus eruditus*. This case is precisely comparable to one that was brought to our notice a year ago by a Milwaukee firm. In that case a prediction was made that within a few weeks the mites would disappear, and it seems probable that in the case of your flaxseed the same thing will occur. If it seems worth while to take the trouble, I would advise the thorough sifting of the seed in the sacks which have been observed to be infested, in order to get rid of the brown earthy-looking substance, which is nothing more nor less than the bodies of the destroyed mites.—[September 18, 1886.

Insects at Electric Lamps.

* * * These beetles (*Galeruca xanthomelæna*) were very injurious to elm trees in Poughkeepsie, N. Y., last summer. Some bands of cotton soaked in oil (I think they were) had been placed around the tree, but did not seem to be of much service, since I picked large numbers of pupæ out of them which afterward developed healthy beetles. The beetles came into the electric lights much less than I should have supposed, for though there were thousands of other species of Coleoptera and Lepidoptera, such as *Leucania unipuncta*, *L. harveyi*, *Cacœcia fervidana*, and a species of beetle unknown to me (of which I took in one week from one-third of the lamps of the city over 6,000), *Galeruca xanthomelæna* was quite scarce, hardly numbering 100 specimens, I should think, in the week's catch above referred to.—[Harrison G. Dyar, Boston, Mass., February 8, 1889.

NOTE.—The beetle referred to was *Harpalus pennsylvanicus*. Of the other Coleoptera a large percentage were Carabidæ.

Bees versus Fruit.

I see that a statement of the experiments of N. W. McLain, of Aurora, Ill., with honey bees, is going the rounds of the papers as conclusive evidence that bees do not puncture grapes. As an observer of the facts in the case, and a practical fruit-grower for the last thirty-five years, and with several colonies of bees quite a portion of the time, I am prepared to say that those experiments are not conclusive. Bees have striking peculiarities, as you are well aware, and in none are they more peculiar than in their tastes. They attack certain varieties of peaches with great avidity, working through the skin and eating into the flesh even before the fruit is thoroughly ripe, while other varieties, to our taste sweeter and riper, are left untouched. Hale's Early is always a favorite with them without reference to the supply of other food. Grapes they do not attack except under certain conditions. These conditions apparently are that the fruit must be very ripe, the weather dry and warm, and other food scarce. They have sometimes destroyed, or rendered unfit for market, tons of grapes in our vineyards in a single day, puncturing the skin so juice would ooze from several grapes in almost every cluster. I had some controversy with Professor Cook, of the Michigan Agricultural College, three or four years ago on the subject, and quoted from some of your observations that bees would under certain conditions attack and damage fruit. With your consent I would like to make use of any facts you may have bearing on the subject. As I do not now remember where to look for the statement I then referred

to, I will be greatly obliged if you will give me the facts or reference.—[H. G. Tryon, Willoughby, Lake County, Ohio, December 6, 1886.

REPLY.—* * * My opinion concerning the question of Bees *vs.* Fruit has for a long time been identical with your own, viz, that under certain conditions bees will and do injure certain varieties of fruit. This opinion was arrived at, however, without thoroughly satisfactory experimentation upon my part, and it was with the view of settling the point, so far as it was possible to settle it by experiments, that I instructed Mr. McLain to carry on the series of experiments to which you refer. As you seem to have seen a newspaper account only, I take pleasure in sending you by to-day's mail a copy of my report for 1885, which contains on pages 336 to 339 the details of his work in this direction. My own comments you will find in the introduction on page 212. I freely admit that my remarks upon his results might have been more qualified and that where I state that the experiments show pretty conclusively that bees do not injure fruit at first hand, I should have said "grapes" instead of fruit, as the experiments were made principally with grapes. You will notice that the word "conclusively" is qualified, and in reality the more I study the matter the more the difficulties of settling the question by such a series of experiments are forced upon me. You must admit, however, that these experiments place the burden of proof upon the affirmative side as far as grapes are concerned.—[C. V. R., Dec. 16, 1886.

Hydrocyanic Acid Gas Treatment for Scale Insects.

* * * I again visited Mr. Gilman a few days ago, and was pleased to learn that he had met with very good success in fumigating his orange trees with hydrocyanic acid gas passed through sulphuric acid; we carefully examined several trees that he treated with the gas when I was there a little over a month previously, and were unable to find any living Red Scales (*Aspidiotus aurantii*), while the fruit and foliage were uninjured. Mr. Gilman says that he treats on an average four trees an hour, using the one apparatus which operates two tents, and estimates that the cost will amount to about 65 cents per tree, his trees being from 10 to 14 feet high by the same in diameter. If it will not be necessary to again treat these trees until after the lapse of four years, this will reduce the cost of treatment to less than twenty cents a year for each tree. Mr. A. Scott Chapman, of San Gabriel, in this county, informs me that some of his father's orange trees that had been treated with this gas nearly two years ago are still remarkably free from the Red Scale, notwithstanding the fact that the adjoining trees are thickly infested with them. The trees treated with this gas, however, are quite as thickly infested with the Icerya as they were when first treated, which clearly shows the great difference in the dispersive habits of these two species.

While at Mr. Gilman's I picked up the following insects from beneath some of the trees which he had just treated with the gas: one *Chilocorus bivulnerus*, two *Exochomus pilatei*, six *Coccinella abdominalis*, four *Psyllobora tædata*, one *Diabrotica trivittata*, four *Largus succinctus*, one *Euschistus tristigmus*, two *Ophion macrurum*, six *Chrysopa* sp.?, five *Musca domestica*, two *Mydea* sp.?, and one spider. The next day all had recovered with the exception of one Largus, the two Ophions, one Chrysopa, the five Muscas, one Mydea, and the spider. Mr. Gilman says that when he leaves the tents charged on the trees all night all of the Lady Bugs on these trees will be killed. The other trees are each confined in the gas twenty minutes, which includes the ten minutes required for generating the gas.—[D. W. Coquillett, Los Angeles, Cal., Feb. 1, 1889.

New Enemy of the Chinch Bug.

I notice you don't mention, as preying on the Chinch Bug, the *Casnonia pennsylvanica* that I found swarming in sheaves of wheat that was infested with the Chinch, while assisting with harvest in Illinois. Years later I found a Casnonia with a Chinch in its mouth among a scattered colony of the latter, at the base of a leaf of green young

corn. But I lost the captor and its victim, the former slipping out of my finger by its thin, flat, long body. I think Casnonias are better fitted to hunt the Chinches than the Coccinellæ, unless the latter are more efficient in the larval state. * * *—[Emile Longuemare, St. Louis, Mo., October 20, 1888.

Army Worm in 1888.

* * * The Army Worm appeared in this section in greater numbers than I ever saw before. They hurt the Barley crop along the lake in Monroe County, 20 per cent. They seemed to be more numerous near the lake. Nearly all I examined were Ichneumonized.—[Harry S. Burnett, Kendall, Orleans Co., N. Y., September 27, 1888.

STEPS TOWARDS A REVISION OF CHAMBERS'S INDEX,* WITH NOTES AND DESCRIPTIONS OF NEW SPECIES.

By Lord Walsingham.

[*Continued from page* 268.]

CEROSTOMA Latr.

Cerostoma radiatella Don.

=*Pluteloptera ochrella* Chamb.

In describing the genus *Pluteloptera*, of which his species *ochrella* is the type, Chambers wrote: "Fore-wings: These differ from those of *Plutella cruciferarum* only by having two branches of the discal vein continued through the cell in which they unite, forming an independent, elongate, triangular cell, beside the secondary cell seen in *Plutella*."

In this and in all other respects the neuration as described and figured agrees with that of the genus *Cerostoma*, and a comparison of a Texan specimen obviously such as Chambers had before him when describing *P. ochrella* from Texas, with a full series of Californian and European examples of *Cerostoma radiatella* Don., confirms the identity of the species.

The figure of the hind-wing in Chambers's plate is not well shaped, but I have no doubt that *ochrella* is merely a synonym of the common and widely distributed *C. radiatella* known to be extremely variable in color and markings; many European specimens being exactly similar to the Texan form. The second joint of the palpi is somewhat more thickly clothed in European than in American specimens, a peculiarity which occurs also in Cleodora.

Cerostoma subsylvella sp. n.

Palpi, on the inner side whitish, the outer side of the long dependent tuft of hairs fawn color; apical joint whitish.

Antennæ, white, annulated with fawn brown.

Head and thorax, pale fawn color.

Fore-wings, pale fawn color, sprinkled and mottled with fawn brown, a patch of dark, purplish fuscous scales on the dorsal margin near the internal angle, and another preceding the anal angle, a faint indication of two similar spots on the costal margin in some specimens, one of which is opposite the second dorsal spot; a few dark scales at the apex. [The dorsal spots are not continued across the wing as in the European species *sylvella*, and partially in *alpella*, nor is there any indication of a longitudinal streak as in the allied American species *cervella* Wlsm.]

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*Index to the described Tineina of the United States and Canada. V. T. Chambers. Bull. U. S. Geol. and Geog. Surv., IV (1), 1878.

Hind-wings, gray, with paler cilia.
Abdomen, fawn gray.
Exp. al., 34^{mm}.
Habitat, Esquimalt, Vancouver Island; 5 ♂, 2 ♀; collected by Mr. J. J. Walker; beaten from Oaks, August, 1882.
Type, ♂ ♀, *Mus. Wlsm.*

TRACHOMA Wlgrn.

Trachoma senex sp. n.

Palpi, tawny, profusely sprinkled with gray; the upper surface of the second joint and the apical joint almost entirely hoary-gray.
Antennæ, tawny, faintly annulated with gray.
Head, tawny; face sprinkled with gray.
Thorax, tawny.
Fore-wings, tawny, sprinkled and transversely streaked with hoary-gray, having several patches of raised tawny scales on the basi-dorsal half of the wing, and one before and above the anal angle; the hoary-gray sprinkling on the basal half of the wing is interrupted by slender lines of tawny scales, and some chestnut-brown is scattered about the fold and the base below the costa; at the middle of the costal margin is a dark tawny-fuscous patch, containing some raised scales, and followed by a chestnut-brown shade, sprinkled with hoary, at its upper edge, and crossed by two longitudinal tawny lines on its lower half; adjacent to the outer end of the lower line is a short oblique streak of pure white; the apical portion of the wing on the costal margin is thickly sprinkled with hoary-white, except the extreme apex, where the chestnut-brown predominates; the apex is falcate, and immediately below it is a pale fawn spot in the cilia; below this the cilia are bright chestnut-brown to the anal angle, where a few tawny-gray scales are intermixed.
Hind-wings, gray, with a faint purplish tinge; cilia somewhat paler.
Abdomen, gray; anal tuft inclining to ocherous.
Exp. al., 20^{mm}.
Habitat, a single ♀, for which I am indebted to Professor Riley, is labeled "Placer County, Cal., Aug."
Type, ♀, *Mus. Wlsm.*

This species is allied to the European *Trachoma horridella* Tr. but differs in the abundance of hoary scales, in the oblique white spot at the end of the cell, and in the chestnut-brown on the costa and at the anal angle.

PTEROLONCHE Z.

Pterolonche lineata sp. n.

Head, antennæ, and palpi, bone-color; the antennæ strongly setulose; palpi porrect, somewhat arched, apex slightly depressed, extending to the length of, approximately, 5^{mm}.
Fore-wings, bone-color, marked throughout with slender longitudinal lines of a darker bone-gray tint, following the veins and the fold and evenly distributed over the wing, as well along the upper portion of the discal cell as beyond its margins; counting these lines across the wing, 8 are distinctly traceable, and a rather short one, tending inwards from the end of the cell, lies between the 4 upper and 4 lower ones; cilia, smoky-gray. Under side somewhat darker than the upper side, having a besmeared, smoky tinge, except along the extreme costal and dorsal margins.

Hind-wings, smoky-gray with a slight brownish tinge; cilia the same but with a pale line along their base and another at their tips. Underside also smoky, but the pale costal margin is rather wider than in the fore-wings.

Abdomen, of the single ♂ before me is denuded by grease; genital appendages very peculiar, the stout pointed uncus projecting far beyond the lateral claspers, of which there are apparently 2 pairs; the upper ones, bulging and rounded above, have attached to their lower edge, small supplementary processes, narrow at the base, swelling towards their ends, and armed with a brush of hairs; the lower pair, somewhat spoon-shaped, narrower at their ends than in the middle and curving slightly inwards.

Legs, bone-color.

Exp. al., 36mm.

Habitat, Arizona.

Type, ♂, *Mus. Wlsm.*

The addition of this interesting genus to the North American fauna rests on the reception of a single ♂ in fine condition from the late H. K. Morrison.

COSMOPTERYX Hb.

Cosmopteryx nitens sp. n.

Palpi, shining bronzy.

Head and face, bronzy-brown.

Antennæ, brown, the apex white and a single narrow white ring about $\frac{3}{100}$ inch from the apex.

Fore-wings, brown, with two conspicuous golden spots at about one-fourth from the base, the upper one scarcely separated from the costal margin, the lower one somewhat larger and extended posteriorly; at about the middle of the wing is a straight transverse golden fascia with a slight rosy or coppery hue, preceding a pale-yellow patch, which is margined by a broad oblique coppery-golden fascia terminating in a white streak on the costa. The pale-yellow patch is divided longitudinally by a rather wide and conspicuous streak of black, extending to the golden fascia on each side, and somewhat nearer to the costal than to the apical margin; the apical portion of the wing is brown, with a slender golden streak along the base of the dorsal fringes, commencing beyond the oblique outer fascia and terminating with some silvery scales at the apex.

Cilia and hind-wings, shining bronzy.

Abdomen, brown, with some shining metallic scales about the sides and anal segments.

Legs, brown, banded with silvery white; spurs also silvery.

Exp. al., 10mm.

Habitat, 2 specimens from Professor Fernald from Texas and 1 from the late H. K. Morrison from Southwest Texas.

Type, ♂, *Mus. Wlsm.*

Cosmopteryx pulcherrimella Chamb.

Chambers, before describing *pulcherrimella*, suggests that *gemmiferella*, *clemensella*, and *pulcherrimella* Chamb. are all one species, and then proceeds to describe the latter as new and distinct. From specimens in my own collection I am able to separate the species with the greatest facility, not only by the pattern and coloration, but also by the position of the white rings on the antennæ. These will be found to present a constant character, so far as my observations go, throughout the different North American species of this genus, which could easily be tabulated systematically.

Cosmopteryx chalybæella sp. n.

Antennæ, brown, a white line along the side of the basal joint and running approximately through half their length; apex white, with two or more white rings, preceded by a dark band before it.

Palpi, whitish, with a slender line of brown scales extending along the outer side of the apical joint.

Head, brown, with central and lateral slender white lines running back over the thorax, which is also brown; face whitish.

Fore-wings, brown, with two short rather broad silvery dashes at about one-fourth from the base, the first nearest the costa, commencing also nearest to the base; a very slender silvery line from the base along the dorsal margin; and a short oblique streak of the same color tending downwards from the costal margin towards the apex of the upper dash; beyond the basal half of the wing is the usual orange-yellow space, limited internally and externally by shining steel-gray metallic spots, the pair adjacent to the costa being much wider apart than the opposite pair, which are adjacent to the dorsal margin; there is a white streak in the costal cilia touching the upper and outer metallic spot, and a similar apical streak is continued a very short distance along the dorsal margin; cilia steel-gray, with a slight greenish tinge.

Hind-wings and cilia, the same color.

Legs, brownish; tarsal joints smeared and spotted with white.

Exp. al., 6^{mm}.

Habitat, Southwest Texas (Morrison).

Type, ♂, *Mus. Wlsm.*

Cosmopteryx quadrilineella Chamb.

I have a single specimen from Sonoma County, Cal., taken in May, 1871, which agrees in size and pretty closely in markings with this species, to which I am inclined to think it belongs. Although the specimen is in somewhat poor condition it can be easily recognized as distinct from *delicatella*.

Cosmopteryx delicatella sp. n.

Palpi, silvery, with some brownish scales towards the base.

Head, brown.

Antennæ, brown, the apex broadly white with two narrow white rings separated from the apex by a still broader brown band.

Thorax, brown, with three narrow silvery white streaks, one central, extending from the head along the thorax.

Fore-wings, brown, the basal portion with four narrow silvery-white lines; the first from the base of the costa tending somewhat downwards; the second commencing opposite to the middle of the first and extending somewhat beyond it; the third commencing beyond the origin of the second and extending very slightly beyond it; the fourth immediately above the dorsal margin, commencing near the base and extending to the origin of the third; about the middle of the wing is a broad pale-orange band, on the basal edge of which are two golden spots, the upper one opposite the end of the second basal streak, tipped with blackish scales; the second farther from the base, larger and more conspicuous than the first, situated opposite to the end of the third basal streak; at the outer edge of the pale-orange band are two similar spots separated by a narrow extension outwards of the orange color, the first situated immediately above the other, but not touching the margins of the wing; a small white streak extends outwards along the costa from the upper spot, and from the narrow extension of the orange band there runs a slender silvery-white line, somewhat arched upwards and terminating in the extreme apex of the cilia; the space above and below it, including the cilia themselves, being of the same brown color as the base of the wing.

Hind-wings and fringes, also brown.

Abdomen, brown, anal segments tending to ochreous.

Legs, brown, spurs and tarsal joints whitish, tibiæ also streaked with white.
Exp. al., 10mm.
Habitat, North Carolina. Two specimens from the late H. K. Morrison.
Type, ♂, *Mus. Wlsm.*

This species evidently approaches very closely to *quadrilineella* Chamb., having the same characteristic four lines on the basal portion of the wing; it has, however, four metallic spots, not three, and a conspicuous white streak on the costa not mentioned by Chambers; moreover, its size is considerably greater than Chambers's species, and it is observable that all the species of this genus are extremely uniform in the expanse of the fore-wings.

Cosmopteryx unicolorella sp. n.

Palpi, brown, with shining white lines along their upper and under sides.
Antennæ, brown, with the basal joint enlarged outwardly, a slender silvery-white line on their upper sides along the basal half, very coarsely scaled beyond the middle; the four apical joints white, preceded by a broad, brown band, which is preceded by one, and after short intervals by three more white joints.
Head and thorax, brown, with three silvery-white lines; one from the top of the head runs along the middle of the thorax, two from the bases of the antennæ along the upper edges of the tegulæ.
Face, shining silvery.
Fore-wings, rich brown; a slender bluish-silvery line from the base along the costa; its outer half turning slightly downwards reaches one-fourth of the wing length; an equally slender silvery-white line reaches somewhat farther along the dorsal margin, and between the ends of these are two short detached silvery streaks; across the middle of the wing is a beautiful purplish, steel-colored, metallic fascia, not quite reaching the extreme costal or dorsal margin; beyond it (without any orange or yellow band, as is usual in this genus) are two large spots of the same color, the first dorsal, the second beyond this costal, from which a conspicuous white dash passes upwards through the costal cilia; the extreme apex is fuscous, with another conspicuous white dash in the cilia below it, preceded by a marginal streak of metallic scales; cilia, brownish-fuscous.
Hind wings and cilia, brownish-fuscous.
Abdomen, brown, with two rather silvery bars before the pinkish-white anal tuft.
Legs, brown; the tibiæ streaked and the hind tarsi spotted at the joints with silvery-white on their outer sides; spurs whitish with conspicuous silvery-white bands around the legs at their bases.
Exp. al., 14mm.
Habitat, Siskiyou Co., Cal. A single ♂ taken in the beginning of June, 1872.
Type, ♂, *Mus. Wlsm.*

GENERAL NOTES.

BLEACHING WINGS OF LEPIDOPTERA.

By the Dimmock process the wings are first acted upon by a saturated solution of the chloride of lime, chlorine being, of course, the bleaching agent. Afterward they are washed in water to which hydrochloric acid has been added, to get rid of the slight deposit of lime. The process is a slow one for thickly-scaled, dark-colored insects, and it occurred to me to try a mixture of the chloride and acid, liberating the chlorine gas. The method was absolutely successful, the wings decolorizing immediately

and being ready for the slide within two minutes. In fact, very delicate wings can scarcely be taken out quick enough, and need very little acid. The advantage is the rapidity of work and the certainty of retaining the wings entire, the chloride of lime sometimes destroying the membrane in part before the bleaching is complete. The disadvantage is the vile smell of the chlorine gas when liberated by the combination of the two liquids. For quick work this must be endured, and the beauty and completeness of the result are also advantages to counterbalance the discomfort to the senses.—J. B. S.

WINTER APPEARANCE OF THE CECROPIA MOTH.

Mr. Warren H. Manning, of Reading, Mass., informs us that Mr. Clark, of the Boston Park Commission, found two specimens of *Attacus cecropia* January 12, 1889, in the street in Boston, apparently numbed by the chilly air. This was one of the results of the long period of mild, spring-like weather in the latter part of December and the first of January, and affords an indication of the probable issuing at that time of many other insects, thus proving what we have so often stated, that the severe winter is more favorable to the successful hibernation of insects than a mild, open winter.

IS MARRIAGE A FAILURE?

Our esteemed correspondent, Mr. R. Allan Wight, of Auckland, New Zealand, to whom we have already referred in these pages, contributes the following to the literature of this important question of the day:

It does seem as if Mr. Green's discovery, that his Ceylon parasite of the spider attacks the *female* only, may have something to do with her propensity to destroy the male as soon as he has fecundated—by the bye, is not that a method of preventing "marriage being a failure" and still avoiding the objectionable divorce? I have been watching two house-spiders in my bed-room (which I would not allow to be removed). The female for more than a month not only allowed her companion to live, but *certainly* manifested plain signs of affection. They were never more than an inch apart, and one was sure to come up to the other if it moved away, placing the feet and legs over it (may I say the hands and arms?). If disturbed, they ran into their back parlor and hid, close-touching, but it did not last long. Whether flies were scarce or not, I can not say, but she killed him and sucked his juice in the end. But the most singular thing is that ever after that she does not seem very alert, and remains always close to the body, and now (after about six weeks) she is dead, hanging close to it, and the broom has been allowed to close the record.

INSECTS UPON THE COFFEE AND TEA PLANTS IN CEYLON.

Our valued correspondent, Mr. E. Ernest Green, of Eton, Punduloya, Ceylon, sends the following interesting notes upon insects affecting Coffee, supplementary to those mentioned by Mr. J. Neitner some years ago:

Allow me to thank you for your very interesting periodical, INSECT LIFE, in the interests of entomologists and agriculturists. I hope your example will lead the way for many other similar publications.

I am sending you, under separate cover, a small pamphlet on "The Enemies of the Coffee Tree," compiled by the late Mr. J. Neitner. Since the publication of this paper many new enemies have made their appearance, notably the *Lecanium viride*, which has practically wiped out coffee cultivation in many districts. Its vigor, the rapidity with which it is propagated have defied any remedial measures that we could afford to apply, and consequently planters are everywhere turning their attention to the cultivation of tea in the place of coffee. The tea plant also has many insect enemies; but, from the method of cultivation, which allows of periodically pruning down the bush, it is better able to withstand them.

I have noted as enemies of the tea, several species of "Red Spider," Tetranychus and allied genera.

Lecanium coffeæ and a species of Aspidiotus. (Fortunately the *Lecanium viride* does not flourish on the tea plant).

Termes fatalis, which eats through the stem just below the surface of the ground.

Several small Lepidoptera belonging to the Tortricidæ.

A boring larva, *Zeuzera coffeæ*.

The larvæ of *Agrotis consurcata* and *A. diffusa* are very mischievous in nurseries of young tea plants.

There are numerous other caterpillars that feed upon the leaves of the tea, but damage caused by them is so small as to be of no account.

It may interest you to know that specimens of a Lecanium found by me on mango leaves, and sent to Mr. J. W. Douglas, of London, have been identified by him as *L. acuminatum*, Signoret (Essai sur les Cochenilles, Annales de la Soc. Entom. France, 1873, p. 397, Pl. 12, fig. 1) described from specimens found on orchids in the Luxembourg gardens in Paris. Mr. Douglas tells me he has lately received this same Lecanium from Demerara, where it is found upon both mango trees and orchids.

It has for some time seemed to us that the scale insects of the coffee plant which do so much damage in Ceylon and other parts of British India could be successfully treated with the remedies which we have found in this country so valuable against the scale insects of the orange, viz, the kerosene soap emulsions, and we hope soon to bring this before the attention of the British Government.

PLANTS INJURED BY CAPSUS QUADRIVITTATUS.

Mr. Warren H. Manning, of Reading, Mass., sends the following list of plants injured during 1888 in Brookline, Mass., by this plant-bug:

The following plants were injured considerably, many others slightly:

Deutzia crenata, badly.
Galium boreale.
Heliotrope (garden), badly.
Lemon Geranium.
Valeriana officinalis, badly.
Tanacetum vulgare.
Aralia spinosa.
Acer Japonicum.
Lysimachia clethroides, badly.
Achillea sp.
Ranunculus acris fl. pl. badly.
Phlox suffruticosa, not P. paniculata.
Hydrangea paniculata grandiflora.
Hibiscus Syriacus.
Philadelphus coronarius aureus.
Lunaria rediviva, very badly.
Campanula persicæfolia.
Polemonium reptans.
Hypericum perforatum, badly.

This insect's impartiality is noticeable, taking, as it did, acrid, bitter, aromatic, and sweet tasting leaves, and smooth or rough surfaces.

IMMUNITY OF SOUTHERN DAKOTA FROM THE CHINCH BUG.

Our old-time friend and correspondent, Mr. W. W. Corbett, of Fargo, wrote us recently concerning the possibility or probability of the appearance of the Chinch Bug in destructive numbers in Dakota. The subject is one of general interest and we copy at length from our reply:

The question which you ask in yours of the 25th ultimo is not one which admits of a thoroughly satisfactory answer. I have thought sometimes that there was danger ahead for the wheat crops of southern Dakota from the Chinch Bug, and I have expected to hear of damage from it. The immunity so far experienced is doubtless due to the fact that the Chinch Bug is essentially a southern insect, occurring in its greatest abundance in portions of the country where the winters are not so severe as they are with you. Occasionally, however, they do some damage as far north as Wisconsin and even parts of southern Minnesota, and I should not be surprised at any time to learn that a race of the species had established itself in these more northern sections and had adapted itself to the more severe cold of your winters. Such an occurrence may, however, be indefinitely postponed. From my experience I would say that your blizzards will prove a great protection against it, but at the same time I would keep on the look-out, and if I had large wheat interests in your vicinity, and were not an entomologist, I would not fail to post myself upon the habits of this insect and watch for it constantly. Another cause of your immunity up to the present time, I think, may be found in the common practice of burning the prairies in autumn in the country that is perfectly new, for this custom has the effect of destroying the bulk of the Chinch Bugs that otherwise would hibernate, and upon these grounds you may expect in the more southern part of your Territory that the insect may become more numerous in proportion as the country is settled up and fenced and prairie fires are prevented.

BURNING THE STUBBLE FOR HESSIAN FLIES.

Mr. Fred Enock and Miss Ormerod have carried on a spirited discussion in the columns of the *Mark Lane Express*, of London, on the advisability of burning the stubble as a remedy against the Hessian Fly. Mr. Enock holds that it is bad policy for the reason that the parasites of the pest are thus destroyed along with the unparasitized puparia. He advocates an extensive rearing of parasites, and an endeavor to cultivate them artificially in order to liberate them afterward in the fields. Miss Ormerod takes quite the contrary view, and holds that burning of the stubble regardless of parasites is the better plan. We had occasion during January to write Mr. Enock upon this subject, and quote from our letter as follows:

* * * The question under discussion is an old one, and one which will probably never be settled to every one's satisfaction. Theoretically you are right, and practically Miss Ormerod is right. At present, and with general entomological knowledge in its present state, there can be no doubt that it will be advisable to burn or otherwise destroy screenings which examination shows to contain puparia. It is a great bother for any one to try to breed parasites, and for a practical man it is out of the question. The burning of stubble is something which depends entirely upon local conditions. * * * There are cases when the consideration of the parasites has an immense practical bearing, but with the Hessian Fly in England to-day I am inclined to believe that the study of the parasites is of value only as indicating the origin of the pest and, by observation of their numbers, as a means of prediction during a

given winter of the probable abundance of the fly during the next summer. The more you experiment in the direction set forth in your articles the more I believe you will be inclined to agree with me.—C. V. R.

Prof. A. J. Cook writes us under date February 15, as follows:

You speak—INSECT LIFE, p. 197—of abnormal bees. I have a still stranger case—a bee half drone and the other half worker. This division is lateral. One side—jaw, eye, wing, and leg—is drone, the other worker. I have seen several bees which have head and thorax of worker and abdomen of drone, or vice versa. This longitudinal sex differentiation is quite new to me.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

February 7, 1889.—Mr. Howard read a paper entitled "Notes on the hairy eyes of some Hymenoptera," in which he discussed the appearance of these hairs and reviewed the very scant literature on the subject, calling attention to the fact that hairy compound eyes occur here and there in isolated genera or groups of genera in many families throughout the order, indicating the genera in which they are known. He announced their discovery in a number of genera of minute Chalcids in which they had not before been recorded, and mentioned the curious fact that there was no gradation between a perfectly naked eye and an eye in which the hairs were comparatively long and perfectly plain. He concluded that these hairs were probably at present functionless and of much less classificatory value than their apparent close relationship with such an important organ as that of sight would seem to indicate.

Mr. Smith remarked in discussion that in the Lepidoptera three variations in the eye were used, *i. e.*, the naked, the lashed, and the hairy. In the Noctuidæ these variations were of generic importance. Mr. Schwarz stated that they were used in the Coleoptera both specifically and generically.

Mr. F. V. Coville read an interesting paper entitled "Notes on Bombus and Apathus at Ithaca, N. Y." He described his methods of observation, and gave at some length the habits of *Bombus borealis* and *B. fervidus*. He could find no distinction of the males of these two species. He had found the males of *Apathus elatus* in the nests of *B. fervidus*, but no males of the latter species. As the female of *Apathus elatus* is unknown, and as he had found the male copulating with the female of the Bombus, he concludes that the species *Apathus elatus* has no real existence.

A general discussion followed this paper, which was participated in by Messrs. Riley, Smith, Howard, Marlatt, C. R. Dodge, Schwarz, Marx, Townsend, Ashmead, Mann, Fox, and others.

Mr. Ashmead read a paper entitled "A note on the genus Tetracnemus," referring to Westwood's original description as giving 5-jointed tarsi and Walker's subsequent redescription as giving 4-jointed tarsi. He exhibited two species from Florida, the one an Encyrtid corresponding with Westwood's description, and the other an Eulophid corresponding with Walker's.

Dr. Marx commented on a letter received from Judge Johnson and identified several species of spiders which he had sent to the society from Florida. He also stated that he had been informed by letter that M. Simon, of France, had in his collection a second species of the new genus Hypochilus.

WM. H. FOX, M. D.,
Recording Secretary.

SPECIAL NOTES.

Mr. Koebele's Mission concluded.—Mr. Koebele returned from Australia and New Zealand by the March steamer. He left Australia late in February, and spent a large part of the month of March in New Zealand with Mr. Maskell and Mr. Wight searching for parasites and other enemies of Icerya. He shipped from Australia before leaving another sending of Monophlœbus and Icerya infested with Lestophonus, and also sent a large number of Coccinellids of four different species, nearly all of which were alive upon arrival in Los Angeles. Mr. Coquillett reports good success in colonizing this shipment, and writes that the Coccinellids particularly made themselves at home, beginning immediately to feed upon Icerya.

In New Zealand Mr. Koebele was unable to find any true parasites, with the possible exception of a small Dipteron, of which, however, he saw only four or five specimens. He found, however, several Coccinellids which feed with avidity upon Icerya, and brought a large number of these to California with him. We expect to publish before long a preliminary report from him on the trip as a whole, which will doubtless prove interesting reading.

One of the interesting results not yet mentioned in these columns was the finding and successful importation of a predaceous Noctuid larva which feeds upon Pulvinaria, Icerya and Lecanium. This insect has received the name *Thalpochares cocciphaga* from Mr. Meyrick, and it may possibly breed and flourish in California, although Mr. Coquillett has just written us that living larvæ received by him refused to feed upon Icerya.

Two other predaceous Lepidopterous larvæ were found by Mr. Koebele, one of which was a Pyralid, which fed abundantly upon *Eriococcus eucalypti*, while the other was a Tineid.

Our Indiana agent, Mr. F. M. Webster, was sent to Australia in December, but remained there only one month and had little opportunity for entomological research, as he was charged with assisting in the preparation of a report for the State Department on the agricultural as-

pects of the Melbourne Exposition. He returned on the same steamer with Mr. Koebele, joining the latter in New Zealand.

Both gentlemen speak in the highest terms of the courtesies which they received both at the hands of the Exposition Board and from prominent men in Australia and New Zealand. Our esteemed correspondent, Mr. Frazer S. Crawford, of Adelaide, was particularly kind and placed every facility at their disposal. It goes without saying that Messrs. Maskell and Wight received Mr. Koebele most cordially in New Zealand.

The Periodical Cicada in 1889.—Brood VIII, which is of the seventeen-year race, will appear this year through quite an extent of country. The region commences in southeastern Massachusetts, extends south across Long Island and along the Atlantic coast of New Jersey, Delaware, and Maryland as far as Chesapeake Bay; then up the Susquehanna River in Pennsylvania, to a point a little below Harrisburg; thence westward in Ohio, embracing the southwestern corner of the State and the northwestern portion of Kentucky, and then upward through southwestern Indiana, ending in central Illinois. It is possible also that there is an eastward extension of the region from Kentucky into southern West Virginia, as Cicadas occurred in 1855 in the Kanawha Valley, and also in the counties of Buncombe and McDowell, in North Carolina; but as these appearances were not verified in 1872, it is probable that they belonged to Brood XVIII, which is of the thirteen-year race.

We shall be glad to receive full accounts this year of all appearances from any of our correspondents, and from all others who will be kind enough to write us of occurrences in their vicinity. Accounts from North Carolina and West Virginia are especially desired, as these will tend to clear up any doubt remaining as to what brood occurred in those States in 1855.

Economic Entomology in California.—We have just received from Mr. W. G. Klee a little work published under the auspices of the State Board of Horticulture, and entitled "A treatise on the Insects Injurious to Fruit and Fruit-trees of the State of California." Mr. Klee is a little weak in his technical entomology, and frequent misspellings of scientific names occur. He quotes freely from other writers, however, and his scientific orthography is not a fault which will trouble his practical readers. His illustrations are mainly borrowed, but most of those which are original are fairly good. His colored plates, which are reprinted from the Biennial Report of the State Board of Horticulture for 1885–'86, are very happy in catching the characteristic appearance upon the twigs, leaves, and fruit of the three species of scale-insects so

figured (*Aspidiotus perniciosus*, *A. aurantii*, and *Icerya purchasi*). He unfortunately, however, reproduces some of the worst of Matthew Cooke's figures, and Comstock's very poor one of *Lecanium hesperidum*. The volume contains also considerable new matter, to which we shall have occasion to refer later.

Kinds Words from a Veteran Entomologist.—The pleasing things which entomologists are writing us concerning INSECT LIFE are very gratifying, but especially so was the following sentence from a recent communication from that veteran and learned entomologist, whom we deem it an honor to call friend, viz, Prof. J. O. Westwood. He writes:

> I congratulate you on the excellent periodical you have inaugurated—INSECT LIFE. I find it full of valuable *new* matter, and its illustrations fully keep up the old style. I wish I could find and support an equal set of clever pupils.

The Lepidoptera of Australia.—We are pleased to learn from a recent communication from Mr. A. Sidney Olliff, of the Australian Museum at Sidney, New South Wales, that the authorities of the museum have recently decided to continue the publication of the drawings and manuscript relating to the life histories of Australian Lepidoptera left by the late Alex. W. Scott and since acquired by the museum. The work of editing and revising this material has been intrusted to Mr. Scott's daughter, Mrs. Edward Forde, and Mr. Olliff. It is to be published on the plan of the three parts which were issued by Mr. Scott before his death, and will probably extend to twenty parts, each containing three or four colored folio plates. The first part is expected about May 1.

Mr. John B. Smith, who has been our assistant in the Department of Insects at the National Museum, has resigned, to accept the more lucrative position of Entomologist of the Agricultural Experiment Station at New Brunswick, N. J. Mr. Martin L. Linell, of Brooklyn, N. Y., has been appointed as an Aid in the Department, and during our absence Mr. Howard will act as Curator. Mr. Linell is an entomologist of considerable experience, and is well fitted to aid in the care of such an important collection as that of the National Museum has become. We regret to lose Mr. Smith from the Washington entomologists, but congratulate him on the appointment, and wish him every success in his new field, in which applied entomology will occupy him more than it has hitherto done.

The Entomologist will sail on the 13th of April for Paris, as one of the Assistant Commissioners to the Paris Exposition, appointed by the

President to report upon Group VIII, which in the main represents agricultural products. Since last autumn much of his time, as the representative of the Secretary of Agriculture, has been devoted to the preparation of an exhibit of the agricultural products of the United States for that Exposition. While his duties in Europe will necessarily prevent active direction of Divisional matters, he hopes by constant correspondence with the office to still keep in communication with the readers of INSECT LIFE.

During his absence Mr. Howard will be Assistant in Charge, and will also act as Curator of Insects for the National Museum.

SYSTEMATIC RELATIONS OF PLATYPSYLLUS, AS DETERMINED BY THE LARVA.*

By C. V. RILEY.

There is always a great deal of interest attaching to organisms which are unique in character and which systematists find difficulty in placing in any of their schemes of classification. A number of instances will occur to every working naturalist, and I need only refer to Limulus, and the extensive literature devoted during the past decade to the discussion of its true position, as a marked and well-known illustration. In Hexapods the common earwig and flea are familiar illustrations. These osculant or aberrant forms occur most among parasitic groups, as the Stylopidæ, Hippoboscidæ, Pulicidæ, Mallophaga, etc. Probably no Hexapod, however, has more interested entomologists than *Platypsyllus castoris* Ritsema, a parasite of the beaver. I can not better illustrate the diversity of opinion respecting its true position in zoology than by giving an epitome of the more important literature upon it.

J. Ritsema, in *Petites Nouvelles Entomologiques* for September 15, 1869, described the species as *Platypsyllus castoris.* He found it on some American beavers (*Castor canadensis*) in the zoological garden of Rotterdam. He considered it to "undoubtedly" belong to the Suctoria of De Geer, and to form a new genus of Pulicidæ.

In the same year, in the *Tijdschrift voor Entomologie*, second series, Vol. V, p. 185 (which I have not seen), the same author publishes what is apparently a re-description of the insect. He gives his views more fully as to its systematic position, considering that it belongs to the Aphaniptera, and is equivalent to the Pulicidæ.

In the same year, Prof. J. O. Westwood (having previously read a description of the species, November 9, 1868, before the Ashmolean Society of Oxford) published in the *Entomologist's Monthly Magazine*, Vol. VI, October, 1869, pp. 118–119, a full characterization of the in-

* Read at the meeting of the National Academy of Sciences, April 20, 1888, and here reprinted from Scientific American Supplement, June 2, 1888, vol. 25, p. 10356.

sect under the name of *Platypsyllus castorinus.* A new order, *Achreioptera*, is established upon the species, which he very aptly likens, in general appearance, to a cross between a flattened flea and a diminutive cockroach. "The abnormal economy of the insect, its remarkable structure, the apparent want of mandibles, our ignorance of its transformations, and the possibility that the creature may be homomorphous in the larva and pupa states," are the reasons assigned for establishing the new order, and here Professor Westwood is perfectly consistent, as in his famous "Introduction to the Classification of Insects" the Forficulidæ are placed in the order Euplexoptera; the Thripidæ in the order Thysanoptera; the Phryganeidæ in the order Thrichoptera; the Stylopidæ in the order Strepsiptera; and the Pulicidæ in the order Aphaniptera.

In 1872, Dr. J. L. Le Conte published his paper "On *Platypsyllidæ*, a New Family of Coleoptera" (Proc. Zool. Soc. of London for 1872, pp. 779–804, Pl. LXVIII), in which he shows that *Platypsylla* is undoubtedly Coleopterous, and can not possibly be referred to the Aphaniptera. Careful descriptions and figures of anatomical details are given, and he finds that its affinities are very composite, but in the direction of the Adephagous and Clavicorn series. Its most convenient place is shown to be between the *Hydrophilidæ* and *Leptinidæ.* There seems to be no good reason why the name *Platypsyllus* is here changed to *Platypsylla*, a spelling adopted by most subsequent American writers.

In 1874, Professor Westwood, in the "Thesaurus Entomologicus Oxoniensis" (Oxford, 1874), p. 194, Pl. XXXVII, gives figures with details; reprints his previous diagnosis, and maintains his previous course in erecting a new order for the insect without giving any additional reasons.

In 1880, P. Mégnin, in "Les Parasites et les maladies parasitaires," etc., Paris, 1880, gives (pp. 66–67) a description of the family "Platypsyllines" without expressing an opinion concerning the systematic position. He also describes and figures the species.

In 1882, Dr. George H. Horn (Trans. Amer. Ent. Soc., X, 1882–'83; Monthly Proc., February 10, 1882, p. ii) exhibited drawings illustrating the anatomy of *Platypsylla* and *Leptinus*, and showed that a close relationship exists between these genera. Later, in his "Notes on Some Little Kno w n Genera ad Species of Coleoptera" (Trans. Amer. Ent. Soc., X, 1882–'83, pp. 113–126, Pl. V, 114–116), he reviews the characters, and explains and illustrates the anatomical details. The differences he points out between his observations and those of Le Conte are more particularly in the mandibles. In connection with this paper he also describes and illustrates the structure of Leptinillus, which he separates from Leptinus, and demonstrates their close relationship with Platypsyllus.

In 1883, Le Conte and Horn, in their "Classification of the Coleoptera of North America" (Washington, Smithsonian Institution, 1883),

give (pp. 13–15) a full description of the family characters, a little modified from Le Conte's first description, but sustaining his views on the systematic position of *Platypsyllidæ.*

In 1883, Alphonse Bonhoure (Ann. Soc. de France, 1883; Bull. des Séances, p. cxxvi) exhibited drawings and specimens of *Platypsyllus castoris* found in the *Département des Bouches-du-Rhône.*

In 1884, Edm. Reitter, in "*Platypsylla castoris* Rits. als Vertreter einer neuen europäischen Coleopteren-Familie" (*Wiener entom. Zeit.*, III, 1884, pp. 19–21 (gives a lengthy description of the species with special regard to the sexual differences. He shows that the European insect is not specifically distinct from the American form, but he does not express an opinion on the position of the family among the Coleoptera.

In the same year Bonhoure (Ann. Soc. Ent. de France, 1884, pp. 143–153) more fully records its discovery on *Castor fiber* taken in the Petit-Rhône. It is a question whether this European beaver, now quite rare, is distinct from ours. He gives a very good review of the subject, with a plate of the most important details, after Horn, and he fully indorses the coleopterological position of the insect.

In the same year Ritsema (*Tijdschrift voor Entomologie*, 1883–'84, LXXXVI) refers to Bonhoure's discovery of *Platypsylla* in France, and corrects Reitter in some unimportant details.

In 1885, Reitter, in "*Coleopterologische Notizen*," XIII (*Weiner entom. Zeit.*, Vol. IV, 1885, p. 274), answers Ritsema's criticism.

In the same year, Dr. Friederich Brauer, in his masterly "Systematisch-zoologische Studien" (Sitzb. der kais. Akad. der Wissensch., XCI, p. 364), speaks of the relationship in the thoracic characters between Mallophaga and Coleoptera as illustrated by Platypsyllus, by inference admitting the Coleopterous nature of the latter, but recognizing that it has Mallophagous affinities.

In 1886 H. J. Kolbe, in his "Ueber die Stellung von Platypsyllus im System" (*Berliner entom. Zeitsch.*, XXX., 1886, pp. 103–105), discusses the subject, without any new evidence, however. He concludes that most of its characteristics relate it to the Corrodentia, and particularly to the sub-order Mallophaga, in which it has its closest kinship in Liotheidæ. The remarkable tripartite mentum he thinks should not be compared with the bipartite mentum of Leptinus, and calls attention to the fact that in Ancistrona in Mallophaga it is also trilobed.

The above are the more important papers on the subject, though the insect has been referred by other authors to both Neuroptera and Orthoptera.

CHARACTERS OF PLATYPSYLLUS.

Where the characters of the imago have been so often described, it is unnecessary to refer to them in detail, and I will only call attention to the more striking structural features, and to some omissions by, or differences between, previous authors. A glance at the illustrations

which I have prepared will show the prevailing characteristics of this interesting creature, its general ovoid and flattened form, and more particularly the flattened semi-circular head. Dorsally, we notice the rather prominent occiput fringed behind with short and broad depressed spines or teeth which form a sort of comb, the prothorax trapezoidal and but very slightly curved, with side margins strongly grooved. There is a very distinct scutellum, and the two elytra are rounded at the tip and without venation. Hind wings and eyes are both wanting. The abdomen shows five segments, each with a row of depressed bristles.

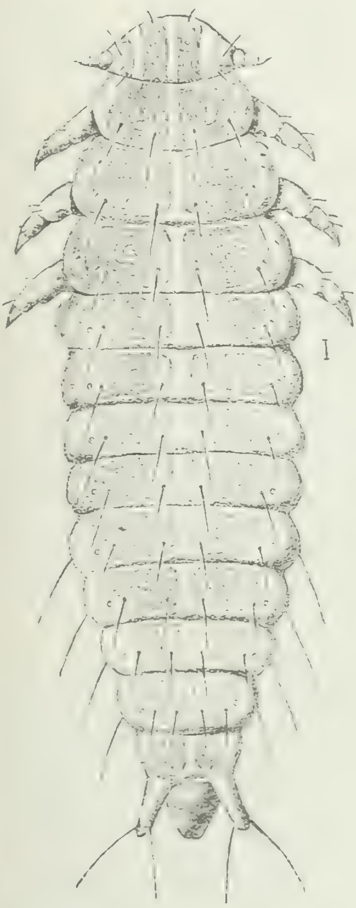

FIG. 67.—Full grown larva of *Platypsyllus castoris*—dorsa lview—greatly enlarged (after Riley).

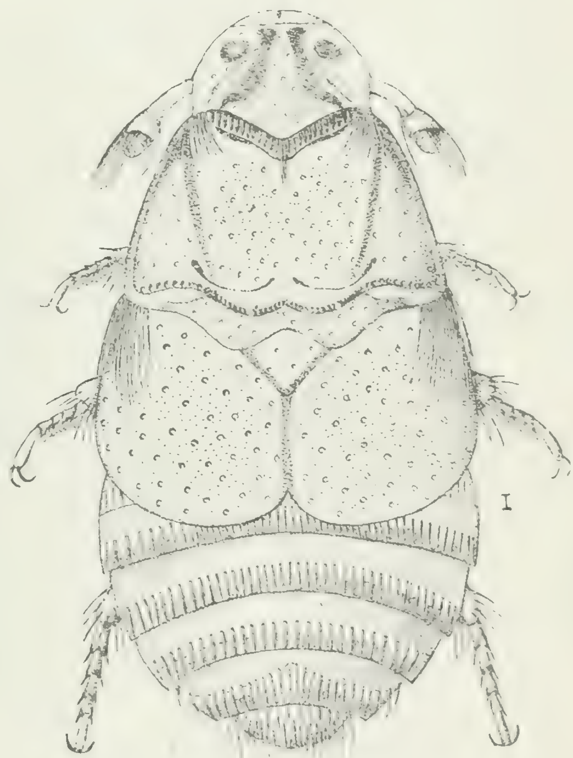

FIG. 68.—*Platypsyllus castoris*, adult—greatly enlarged (after Riley).

On the ventral surface we find among the more curious characteristics, first the antennæ; these were originally described by Westwood as three jointed, the club being annulated. Le Conte could not distinctly make out the number of annular joints upon this club, though he thought he detected seven, which made nine joints to the whole antenna. The club is received in the deep cup-shaped excavation of the second joint. Horn thought he detected a division of the second joint, and resolved but six segments in the club, making also nine joints to the whole antenna, but in a somewhat different fashion from Le Conte. Westwood's figure shows eight annuli to the club. He failed to find any trace of the mandibles, but Le Conte described them as small, flat, subquadrate, with the inner side deeply crenulate, and resembling those

of *Corylophus;* the stipes well developed, and bi-articulate. Horn could not entirely make out the mandibles as described by Le Conte, and rather concluded that what Le Conte described is really one of the granules which occur behind the labrum. He considered that the piece could hardly be even an aborted mandible, because of its diminutive size.

FIG. 69.—Young larva from below—greatly enlarged (after Riley).

What all authors have agreed in calling the mentum is very noticeable, being large and broad, and trilobed behind. The maxillæ are strong, with complicated stipes, and with two flat thin lobes, the inner one smaller than the outer and rounded at the tip, both lobes being ciliate. The maxillary palpi are four-jointed, the labial palpi three-jointed. The prosternum is very large, subtriangular, concealing the insertion of the coxæ, and extending over the front part of the mesosternum, as does this over the front of the metasternum. Six ventral segments of the abdomen are visible behind the posterior coxæ, which conceal two and the base of a third. The coxæ are flat and not at all prominent. The legs are characterized by broad and flattened tibiæ and femora, and the strong spines with which they are armed. The tarsi are five-jointed, the front and middle pair with a row of claviform membranous appendages each side, which Le Conte found only in the male.

American entomologists have been satisfied to follow Le Conte and Horn as to the position of Platypsyllus. Yet with such diversity of opinion on the subject among high European authorities the importance of a knowledge of the adolescent states has been recognized, as the character of either the larva or pupa would settle the question.

During a stay at West Point, Nebr., in October, 1886, I learned from one of my agents, Mr. Lawrence Bruner, that there was a beaver in a creek not far from that point, and I at once made arrangements for him to trap the beaver, and to look particularly for living specimens of Platypsyllus on the skin, and especially the earlier stages. He succeeded in capturing the beaver and sent me some fifteen specimens of the larva and also some imagos, but neither eggs nor pupæ were found. A glance at the larva satisfied me at once of its coleopterous nature; but as we have, waiting to be worked up and published, an *embarras de richesses entomologiques* in the collections of the National Museum, and as circumstances largely decide the precedence, I should probably not have called attention to this larva for some time, had it not been that at the last monthly meeting of the Entomological Society of Washington, Dr. Horn, who was present, announced the finding, the present spring, by one of his correspondents, of this very larva, and exhibited a specimen. Some points about it, and especially the position of the spiracles, being

yet rather obscure in his mind, he requested me to examine my material, which I have thus been led to do. I have made a figure of this larva which will sufficiently indicate its nature.

The general form of the trophi, and particularly the anal cerci, fully settle the disputed point, and remove this insect completely from the Mallophaga (none of which possess them), and confirm its position in the Clavicorn series of the Coleoptera. Yet in the larva, as in the imago, the effects of its parasitic life are shown in certain modifications, which approach the running section of the Mallophaga. Without going into details I may say that, besides its general and more decided coleopterological features, this larva is distinguished by the shortness and stoutness of its legs, by the size and stoutness of the antennæ, by the stiff and long depressed hairs on the dorsal and more particularly on the ventral surface, and by the dorsal position of the abdominal spiracles, all characters approaching the Mallophaga. The first pair of spiracles is lateral, and may be said to be mesothoracic, being placed on the mesothoracic joint, but on a distinct fold. The eight abdominal spiracles are placed on the sides of the dorsum, and in this respect recall the parasitic triungulin of the Meloid larvæ. The mandibles are barely corneous, and they are more elongate and curved in the younger than in the older larva, while the legs are also relatively stouter, more curved, and with a much longer and sharper claw in the younger larva, which seems well fitted for grasping the hairs of its host.

There can no longer be any doubt, therefore, about the true position of Platypsyllus. The eggs will probably be found attached in some way to the hairs of the animal they are laid on, much as they are in Mallophaga, and the pupa is probably formed in the nests of the host and not upon the skin, which will explain the reason for its not occurring with the larva and imago upon the beaver, either in the case of my specimens or those of Dr. Horn.

The greatest resemblance of Platypsyllus in the imago state to the Mallophaga is found in the spinous comb on the hind border of the occiput, the arrangement of the spines on the abdomen, and the superficial antennal structure, but particularly in the broad trilobed mentum. All of the other characteristics are readily referable to the Coleoptera, though, as Le Conte pointed out, they are composite, recalling in the antennæ, the Gyrinidæ, in the pronotum the Silphidæ, in the mesosternum Limulodes, in the elytra the Staphylindæ, in the legs the Anisotomidæ, and in the mandibles the Corylophidæ. The scutellum and the five-jointed tarsi at once remove it from Mallophaga, and it is a wonder that Le Conte and Horn have not more fully insisted on this fact. The trophi are very complicated, and there are various details of structure not noticed or not mentioned by any of the writers upon the subject hitherto.

I have been led to very carefully examine the imago, and the more closely I have done so, the more completely I realize the accuracy of

Le Conte's original work. The mandibles are visible or not, according as they are exposed or withdrawn, and their existence may depend on the sex, as, so far as my material justifies conclusion, they are visible in the male only. Where found, they correspond to Le Conte's description. Even in the larva they are weak and of doubtful service in mastication, while in the imago they are, as is also the labrum, quite rudimentary; which fact hardly justifies us, however, in arguing their non-existence.

As confirmatory of the affinities of Platypsyllus, as here proved, it may be mentioned that *Leptinus testaceus* Müll., the only species of its genus, is known to be parasitic on mice, as it has been found upon them in Philadelphia by Dr. John A. Ryder, and I have taken it in the nests of a common field mouse near Washington; but still more interesting is the fact that *Leptinillus validus* Horn (also the only species of its genus) is an associate parasite of Platypsyllus on the beaver, a number of both having been taken by one of my agents, Mr. A. Koebele, in San Francisco, from beaver skins brought from Alaska.

In reference to the classificatory value that should be attached to an aberrant type like this I have already expressed my opinion in a paper on Megathymus, a Lepidopteron that connects in many ways the two great divisions of butterflies and moths, published in the Transactions of the Academy of Sciences of Saint Louis, Volume III, 1876, and will take the liberty of reading a few passages therefrom:

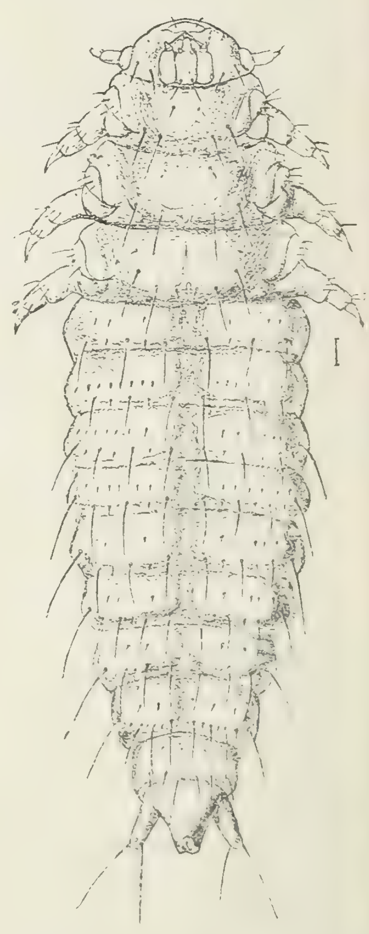

FIG. 70.—Full-grown larva from below—greatly enlarged (after Riley).

Between all classificatory divisions, from variety to kingdom, the separating lines we draw get more and more broken in proportion as our knowledge of forms, past and present, increases. Every step in advance toward a true conception of the relations of animals brings the different groups closer together, until at last we perceive an almost continuous chain. Even the older naturalists had an appreciation of this fact. Linnæus's noted dictum, "*Natura saltus non facit,*" implied it; and Kirby and Spence justly observe that "it appears to be the opinion of most modern physiologists that the series of affinities in nature is a concatenation or continuous series; and that though an hiatus is here and there observable, this has been caused either by the annihilation of some original group or species, or that the objects required to fill it up are still in existence but have not yet been discovered."

Modern naturalists find in this more or less gradual blending their strongest arguments in favor of community of descent; and speculation as to the origin, or outcome rather, in the near present or remote past, of existing forms is naturally and very generally indulged, even by those who a few years back were more inclined to ridicule than accept Darwinian doctrine. Shall we then say that the old divisions must be discarded because not absolute? As well might we argue for the abolition of the four seasons because they differ with the latitude, or because they gradually blend into each other. Entomologists will always speak of moths and butterflies, howsoever

arbitrary the groups may come to be looked upon, or however numerous the intermediate gradations.

Families should, I think, be made as comprehensive as possible, and not unduly multiplied; and in considering aberrant forms, the objects of classification are best subserved by retaining them in whatever division can claim the balance of characters. It is better to widen than to restrict in the higher groups. Le Conte does better service in bringing Platypsylla among the Coleoptera than does Westwood in creating a new order—Achreioptera—for it. Phylloxera, in Homoptera, is much more wisely retained in the Aphididæ than made the type of a new family.

Platypsyllus, therefore, is a good Coleopteron, and in all the characters in which it so strongly approaches the Mallophaga it offers merely an illustration of modification due to food habit and environment. In this particular it is, however, of very great interest as one of the most striking illustrations we have of variation in similar lines through the influence of purely external or dynamical conditions, and where genetic connection and heredity play no part whatever. It is at the same time interesting because of its synthetic characteristics, being evidently an ancient type from which we get a very good idea of the connection in the past of some of the present well-defined orders of insects.

Westwood, though now an octogenarian, may safely be called England's most eminent entomologist by virtue of the character and volume of the work which he has accomplished. Dr. Le Conte was *facile princeps*, America's leading coleopterist. I do not know that any greater tribute could be added to the sound judgment and deep knowledge possessed by that late distinguished member of the Academy than the confirmation of his views as opposed to the views of Westwood and other European authorities which the discovery of this larva now gives us.

STRIDULATION IN VANESSA ANTIOPA.

By A. H. Swinton, Bedford, England.

Although the sound made by this butterfly without doubt is the expression of certain emotions, be it of anger or of love, since it is not made by the emission of the breath, we can not, I think, consider it more than elementary voice, and in the present instance a singularly erratic development of its elements. It may be that

> "In Loraine ther notis be
> Full swetir than in this contre,"

for English entomologists are, I believe, generally of opinion that the sound which butterflies make is caused by their rubbing their wings together in their ardor. In the *Entomologist's Monthly Magazine* for February, 1877, page 208, I find the following notice:

In 1872 a female *antiopa* came into my possession in a hibernating condition, and in that state she would, when disturbed, partially expand her wings, and at the same time was produced a grating sound, which seemed to come from the base of the wings.—A. H. Jones, Shrublands, Eltham.

The *V. antiopa* is only a migrant to this country and seldom seen, but it breeds in Europe and northern Asia, commonly along willow-bordered streams. I have a few specimens from the banks of the Po, and from one of these I have detached the fore wing. (See Fig. 71.)

Fig. 71.—Diagram of fore wing of *Vanessa antiopa* (original).

Along the hinder edge of this I notice a smooth projecting vein, *b*, to run, which looked at in the direction, *a*, is seen with a strong magnifier to be flattened and notched like a file for not quite half its length. This vein, when the wings are expanded, rests on another projecting vein on the hinder wing, in such a manner that when the upper wing is moved the notched vein rubs over this vein as the bow rubbed with rosin works on the violin string.

Let any one now take a dried specimen of this butterfly from the cabinet and grasping the fore wing by its front edge rub it backwards and forwards over the hinder one, so that the bases meet, but being at the same time careful not to crumple the wings and so produce a false sound. He will then without fail hear the sweet secrets of *antiopa*, which are beautiful and delicate in expression, recalling the trickle of the brooklet.

I may notice that the *Vanessa* butterflies are renowned and well-known as stridulators on account of their large size, but that nearly all butterflies rub their wings together when under the influence of the emotion of love, and since it is the result of friction to produce a striated surface, many of these smaller ones must have organs of sound too fine for human sense. My own researches have always been circumscribed from a want of adequate microscopic power.

NOTES ON THE TENACITY, ELASTICITY, AND DUCTILITY OF RAW SILK.

By Philip Walker.

The tenacity of a silk filament is that property by virtue of which it resists rupture when stretched. Its ductility is the property which permits it to stretch without rupture; and its elasticity the virtue which enables it, after stretching, to recover to a certain extent its initial length. In ordinary parlance the tenacity of a silk thread is the weight, in grams, necessary to produce rupture. In determining the tenacity the force is generally exerted on a thread 50 centimeters long.

The properties of elasticity and ductility come into play simultaneously in the operation of stretching.

This fact was first determined by M. Robinet,* a Frenchman, who in 1838, and for ten years following, devoted himself to this and similar subjects with great advantage to sericultural science.

Thirty years later the subject was again attacked by M. Persoz,† of the Paris conditioning house, and at about the same time by M. Paul Francezon, of Alais (Gard). I owe to them a large part of the information contained in these notes.

If a thread a meter long is suspended from a fixed point, and to the lower end a weight is attached so as to stretch it 50 millimeters, this stretch will, upon the removal of the weight, diminish to about 35 millimeters. This 15 millimeters of recovery represents the elasticity of the filament and the 35 the ductility under the tension of the weight employed. If, on the other hand, we stretch it still farther, the proportion of ductility becomes greater and of elasticity less, until at between 15 and 20 per cent. (usually) the limit is passed and the filament breaks.

When the stretch approaches the limit of elasticity the recovery is very slow in a dry atmosphere, but more rapid in the presence of moisture. Thus, a thread 50 centimeters long, stretched 5 centimeters, or 10 per cent., when relieved of its load, recovered at once 25 millimeters; in the first half hour this increased to 3 centimeters. It was then moistened, and immediately recovered another half centimeter; during the following minute it shortened until but 1 centimeter of stretch remained and then the recovery stopped.

But although there is evidently a very distinct action of elasticity and ductility in the stretching of a silk thread, it is found sufficient in the commercial testing of raw silk to examine their joint action and to determine the total stretch of which a given thread is capable without breaking.

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* *Mémoire sur la Filature de la Soie*, Paris, 1839, and a series of memoirs published from 1843 to 1848, which are unfortunately not in the library of the Department.

† *Essai sur le Titrage et le Décrensage de la Soie*, Persoz, Paris, 1878.

Through some unexplained misconception, this per cent. of stretch is called the elasticity, though it were more properly styled the ductility of the thread. Adopting, however, the consecrated usage, we shall continue in these notes to use the term "elasticity" with this significance.

The elasticity of silk in its normal state is, as has been stated, from 15 per cent. to 20 per cent. Many conditions, however, may vary these results within and even beyond these limits. One of the most important of them is the amount of water contained in the silk. By the term "normal state" I mean about the same as by "conditioned weight;" that is to say, its state in an atmosphere of moderate dryness.

As an instance of the above I may cite the example of a thread which in the normal state had rather less than the average elasticity, that is to say, 14.7 per cent., which when thoroughly moistened only broke when elongated 19.4 per cent.

Among the more accurate of experiments on this subject are those of M. Persoz. They may be summarized as follows:

The presence of an excess of water in the silk exercises a notable effect on its elasticity, and (according to this author) on its tenacity, increasing the former and decreasing the latter. On the other hand, silk reduced to absolute dryness loses slightly in tenacity, but very considerably in elasticity. This is shown from the following experiment upon a 1.62 gram* white reeled silk:

Description.	Tenacity.	Elasticity.
	Grams.	*Per cent.*
(1) Thread soaked in water for twenty-four hours	115	22.3
(2) Thread in its normal condition	132	19
(3) Thread dried at 128° C	127	8.2
(4) Boiled off	102	14.2

It will be seen that between Nos. 2 and 3 the tenacity has diminished 3.8 per cent., and the ductility 56.8 per cent., and that between Nos. 2 and 1 the ductility has increased 17.4 per cent.

M. Francezon, who enjoys the reputation of being, from a scientific point of view, the most talented silk reeler in France, has also made exhaustive experiments on the elasticity and tenacity of silk, and his conclusions are in some points different from those of MM. Robinet and Persoz. Unfortunately, I have not been able to obtain his writings and therefore am forced to derive my information of his work from secondary sources.†

M. Francezon so improved the use of the serimeter as to compare, with entire precision, silks differing in size and in hygrometric condition. To evaluate the hygrometric condition during these tests, the skein to

* That is to say, a silk weighing 1.62 grams per 500 meters. The weight in grams of a skein of this length is the international standard for the sizing of silk adopted by the congress of Brussels.—P. W.

† Maillot—*Leçons sur le Vers á Soie de Murier*, p. 205.

be tested was wound upon a reel 1.250^{m} in perimeter and then cut exactly into two equal parts; one of these halves was weighed at once, and again after drying (absolutely), which gave the conditioned weight sought, as well as the quantity of water contained before the tests; the other half served in part for the tests and what remained was weighed as it was, and again after drying, which gave the weight of water contained after the tests; the mean obtained from these weights was taken as the average "hygrometric condition."

As a result of these experiments M. Francezon differs from both the authors already quoted by concluding that humidity has no effect on the tenacity. In relation to the elasticity, however, he has found where the silk contains not less than 8 per cent. and not more than 11 per cent. of water a variation of 1 per cent. of moisture more or less will occasion a variation of elasticity in the same direction of about 10 millimeters, (or 2 per cent.). His tests were made on first quality yellow French and green Japanese silks.

The presence or absence of gluten (*grès*) in silk has an appreciable effect on its tenacity and ductility. In the above table the loss of tenacity between No. 1 and No. 4 is 22.7 per cent., and of ductility 25.3 per cent. But in other tests these figures have reached 30 per cent. for the tenacity and 45 per cent. for the ductility.

In the matter of the charge of silk thread, it may be said that those substances which coat the fibrine, such as albumen and gelatine and its own gluten, probably increase the tenacity, while of those which penetrate and dilate the fibrine, some coloring matters are without effect, and others, such as the metallic salts, used to excess in producing black dyes, reduce the tenacity materially, and often entirely, so as to cause the tissue woven of it to crack when folded.

Aside from these extraneous influences upon the elasticity and tenacity of silk, there are others inherent in the silk itself, such as the volume of the thread and the number of filaments of which it is composed.

The tenacity of silks is not proportional to their size. The tenacity of silks composed of the same number of threads augments with their volume but by decreasing differences; in other words, all conditions being equal, the finer silk is proportionately stronger and its tenacity greater.

The tenacity of silks composed of increasing numbers of filaments increases in a proportion more rapid than the increase in the volume of the silks; in other words, the tenacity augments by increasing differences in a series of silks composed of increasing numbers of filaments.

For a given size the strongest silk is that into the composition of which enter the greater number of filaments. In other words, if two silks have the same size, while one is composed of four filaments and the other of five, it is the last which is the stronger and has the greater tenacity. The tenacity in composite silks increases proportionately with the number of contacts between the filaments.

The mean tenacity of silk for a thread of one square millimeter cross-section is 43.620 K. (95 pounds). *

* For demonstration see Maillot "*Leçons,*" etc., page 204.

In silks composed of the same number of filaments the relative ductility is not proportional to the volume. In the same silks the absolute ductility increases in a proportion which is very small when compared with the increase in the volume.

In silks composed of increasing numbers of filaments the elongation is not in proportion to the volume. In the same silks the relative ductility is almost in an inverse proportion to the volumes. In the same silks the absolute ductility augments to a certain degree with the number of filaments. These augmentations of ductility are successive and show a certain degree of regularity.

The volumes being equal, that silk is the most ductile into the composition of which enter the greatest number of filaments. In other words, given two silks of the same size, if there are five filaments in one and six in the other the latter will be the most ductile.

Therefore, although augmentation in volume in silks composed of the same number of filaments has an almost insensible influence on their ductility, an increase in the number of filaments increases the ductility to a considerable degree. This effect of the solidarity of the filaments is, however, very different for the ductility and the tenacity. The solidarity causes the tenacity to increase in a greater proportion than the increase in the number of filaments, while the ductility does not by any means increase in this proportion.

The general conclusion which is naturally presented to the mind after having thought over the facts recorded above is that silk is a much more homogeneous matter than was thought at first. The race of the worms, the climate, the nature of the food,* nothing, in fact, appears to sensibly alter its composition and its essential properties.

Whether it comes from the North or the South, from a feeble or a robust worm, whether it be white or yellow, fine or coarse, brilliant or dull, we find the same composition, the same proportional strength, the same elasticity. This all depends, however, on one condition—that all the samples examined shall have been reeled under the same conditions.

Some of the influences which have been thought powerful and capable of profoundly altering the essential properties of silk are almost powerless. Such are the age of the cocoons or of the reeled silk, the nature of the reeling-water and its temperature. On the other hand, it seems demonstrated that the processes and the mechanisms which have the effect of augmenting the tension of the silk thread during its development may alter it in an essential manner, above all its extensibility.†

EXTRACTS FROM CORRESPONDENCE.

Borers in a traveling Trunk.

On pages 258–262, Annual Report Commissioner of Agriculture, 1885, just received, you deal with the Leather Beetle. Possibly the following which at the time was a revelation to me may also interest you. In September, 1866, I bought a fine solid Russia-leather trunk in St. Petersburg. The price did not seem high. It had an additional outside linen cover, and I never noticed any sign of gnawing by insects. It was traveling with me until January 7, 1867; then quiet in my paternal trunk-room in New York until May, 1867; then with me in Washington until May, 1868; then with me in the old Cincinnati Observatory, Mount Adam, Cincinnati, until November, 1870. During these last two years I believe that I did not use it or move it from

* No food but the mulberry was used. It remains to be seen if the Maclura will give different results.—P. W.

† These last paragraphs are quoted by M. Persoz from the second of a series of memoirs published by M. Robinet between 1843 and 1848.

the store-room, where, however, it was in a good light and not near any old leather. Yet when I opened it to use it in October, 1870, it was riddled with holes and the beetles or furry-covered grubs were everywhere. I concluded that one or more must have been in it from the beginning unperceived and were thus imported from Russia, as I had never heard of such bugs in this country. I had bought the trunk under the impression that the peculiar odor of the Russia leather would repel moths and insects, but I was thus undeceived. The burrows were worse in the leather, but there were enough in the linen and especially in the wood, a hard hickory, to show that the beetle or grub was omnivorous. The trunk has long since gone to the old junk shop, but the bugs will remain, as they seem to have gotten into the carpets and house generally. I trouble you with this to ask organization and laws to prevent the importation of foreign injurious insects just as for diseases, paupers, etc.—[Cleveland Abbe, Washington, D. C., November 4, 1886.

NOTE.—We attempted at the time to secure specimens of this insect in order to determine it, but Professor Abbe was unable to furnish them.

An early Note on the Periodical Cicada.

In the *Western Monthly Magazine*, No. XXI, September, 1834, published at Cincinnati, I find a note on the Periodical Cicada which seems not to have come under your observation. It is in the form of an extract from the first number of "The Advocate of Science and the Annals of Natural History," published in Philadelphia, and reads as follows:

"The year of its appearance, however, varies in different sections of the country. In 1792, according to Barton, it visited the neighborhood of Elizabethtown, N. J., and had certainly appeared there three times before, at regular intervals of seventeen years. In 1797 it appeared in some parts of the State of New York. In 1800 it visited most of the Southern and Middle States. It is known to have observed the period of seventeen years in this extensive section of country, both before and since that time. In the middle and western portions of the State of North Carolina it appeared in 1803."—[S. A. Forbes, Champaign, Ill., May 8, 1888.

More Evidence bearing on Spider Bites.

Having seen a statement, taken from the Saint Louis Globe-Democrat, in regard to your investigating a case of spider-bite in North Carolina, I thought it might perhaps be of interest to you to give a statement of a case which occurred in my family at Augusta, Woodruff County, Ark., in the summer of 1870.

My little son, then about sixteen months of age, ran his finger into the key-hole of the front door, and uttered a scream. I took him away, but could see no cause for his continued screaming. I then thrust a stick in the key-hole, and a black or brown spider, with a bright red spot either upon the back of the head or upon its back, ran out. We put or bound common baking soda upon the finger, when he seemed to be relieved, and I went to the court-house, as I was holding my court at the time. But before time to adjourn court my wife sent me word that the boy was in spasms. We called in our doctor, and he claimed he had never known or heard of such a case, and seemed to doubt that the trouble was thus caused; by giving a powerful cathartic the boy was relieved of his spasms, but he died in less than a year of dysentery, and we always felt that the spider-bite led to his death, as it seemed he never recovered from the effects.—[A. D. Blanchard, Oneonta, N. Y., March 8, 1889.

Buffalo Gnats on the Red River.

I wish to call your attention to the fact that train-oil, or any kind of fish-oil, is an absolute preventive against the attack of Buffalo Gnats when applied in very small quanties to work animals. I have experimented with tar water and other remedies recommended in Report for 1886, and find nothing to compare with the cheap train-

oil. Many people are not satisfied to use the simple oil, but insist upon mixing tar and other useless things with it, which disfigure the animal by causing the hair to come off. Almost every one in this neighborhood is now acquainted with this remedy, but it may be well for me to direct your attention to it for future reference. We own about two hundred mules, and our lands extend from the margin of Wallace Lake along that of Cannisnia and Edwards Lakes for the distance of 20 miles, where this gnat breeds in vast numbers at this season of the year. We never had any serious experience with these gnats until the spring of 1885, when we lost fifteen mules in one week. At that time we were ignorant of the danger of their bites or the remedies against them, and treated the mules for colic, as they swelled up and showed every symptom of that disease. Since that time the gnats have come in swarms every spring about this date. I attribute this to the fact that a raft of some 10 or 12 miles has accumulated in Bayou Pierre, opposite to our possessions, which makes a perfect breeding place for them. The Government is responsible for this raft, as all the logs which were removed from the raft above Shreveport were directed by their engineer, Major Woodruff, into Jones Bayou, for the purpose of closing that stream.—[G. A. Frierson, Frierson's Mill, De Soto Parish, La., March 11, 1889.

REPLY.—I beg to acknowledge the receipt of your interesting letter of March 11 and to thank you for the information which it contains. We have come to practically the same conclusion in regard to the superior efficacy of fish-oil for Buffalo Gnat bites. The conditions which you describe regarding the accumulation of logs in Bayou Pierre are very favorable to the increase of the gnat, and I have no doubt that you are right in attributing the abundance of these pests to the Government operations.—[March 18, 1889.]

A Beetle living in an Insecticide.

Some two or three years ago samples of various substances used for insecticides were placed in the Agricultural Museum of Purdue University, at La Fayette, Ind. As the object was merely to display the substances, they were placed in the glass flasks, such as are used for similar displays of seeds, the mouth being in the base when the flask is in an upright position. One of these flasks contained several ounces of powdered white hellebore, which, as it was never disturbed, had settled into a somewhat compact body. On removing this flask a few days since the cork stopper was found to have been burrowed through, evidently from without, and the mass of powder was literally full of burrows and channels passing through it in all directions. On turning the powder out upon a table and examining it carefully two adult beetles of *Tenebrioides mauritanica* were found dead in the burrows in the powder. How long these beetles had remained in the powder alive it is obviously impossible to state; but it would be safe to say that they entered it from motives of choice, and either subsisted upon it or else did an incredible amount of tunneling without sustenance. While at the time the beetles were removed from the powder the latter was not fresh and did not retain its full strength, there still remained enough to impart a tingling, burning sensation to the nostrils when any of the powder was inhaled through the nose, yet not enough to set one to sneezing.—[F. M. Webster, Purdue University, La Fayette, Ind., December 23, 1887.

The new Flour Moth in England.

We have a flour caterpillar in England—newly arrived, in the last two years—which is so very troublesome and injurious where it establishes itself, that I should like to place a short account of it in your hands, hoping that at your leisure (I should rather say at your best convenience, for leisure you have none) you may kindly tell me whether you have it in the United States, and if so whether you manage to keep it in check. The caterpillars were first observed in Europe in 1877, by Dr. Jul. Kuhn, of Halle, doing much mischief in the process of grinding some American wheat. The imagos from

these larvæ were placed by Dr. Kuhn in the hands of Professor Zeller, who considered them to be *Ephestia*, of a species previously undescribed, and they were named by him *kuhniella* specifically, after their observer. All this most likely you know well, but it is the appearance of this pest here which I am more particularly writing to you about. In 1887 the caterpillars did great harm in some large stores in London, and last year the attack established itself in a wheat-flour steam-mill in the north of England. The great harm caused is by reason of the caterpillars "felting" up the meal or flour by the quantity of web which they spin in it. They feed of course, but this is not so injurious as working up the flour together, as they clog the mill apparatus to a very serious extent.

I have much reduced their numbers by getting the manager of the steam-mill to turn on scalding steam; and cleaning, whitewashing, and some use of paraffine have done good. The real cure would be to change the material ground. If we could use rye-meal for a few weeks we could clean out this wheat-flour feeding caterpillar effectually. Unfortunately, however, the delicate apparatus of our recently arranged wheat-roller mills does not allow of this. One point that would help us in preventive measures would be to know where the attack comes from. I am told it is a "scourge" amongst the flour—or rather the meal, as it prefers the more branny parts—in wheat from Russia and Hungary at the Mediterranean ports, so I am making inquiries, but Dr. Lindeman is not aware of this attack having been noticed in Russia. Under these circumstances I thought that I would write to you about it, and if you are acquainted with this moth and the larval workings—still more if you know how to destroy it—I should feel greatly favored and obliged by any information that you may kindly give. I believe that unless it has very recently been placed on your American lists of Lepidoptera it is not noted as known there, and I am trying to persuade myself that it is not all selfishness which makes me trouble you thus, but that, if by any possibility you may not chance to have heard of the serious nature of the work of these larvæ, you may care to have a few lines about them.

The moth is about three-fourths of an inch in spread of the fore wings, which are of pale gray with darker transverse markings; the hinder wings remarkable for their whitish semi-transparency, with a darker line from the point along a part of the fore edge. The larvæ when full grown, as far as I see, are about five-eighths of an inch long and palish flesh color, lighter when older, head yellowish-brown—you will not care to have full description—but they have surprising instinct for traveling, and amazing strength. One that I watched to test this power escaped from under a little smooth-edged card-board frame which I had placed on a woolen cloth on a quite flat table and pressed down with a 1-pound weight.—[Eleanor A. Ormerod, Torrington House, St. Albans, England, March 6, 1889.

REPLY.—Your letter of March 6 in reference to *Ephestia kuhniella* has just come. I am familiar with the substance of your letter, as I have read the papers by Mr. Klein in the Transactions of the Entomological Society of London, 1887, and in the *Mark Lane Express;* by Mr. Tutt in *The Entomologist,* and by Mr. Barrett in the *Entomologist's Monthly Magazine.* I think I can safely say that this species does not occur in the United States. Our *Ephestia* which has similar habits is the *interpunctella* of Zeller (*zeæ* Fitch). Fitch's account is published in his Second Report on the Noxious, Beneficial, and other Insects of New York, under the name of *Tinea zeæ.* He calls it the "Indian Meal Moth," "Indian meal" being the American name for the meal of maize. It will be a very difficult pest to fight and the measures which you have already adopted are probably the best which can be suggested.—[March 22, 1889.]

Abundance of an Iulus in Dakota.

Inclosed please find samples of a destructive and very annoying insect. I do not know its name; it is not poisonous. They first invaded us in September, coming in countless numbers in the yard, then in the house, and in everything they could find to eat. They have a special liking for sweet milk, pies, sauces, etc. When digging

potatoes I found as high as one hundred and fifty-three in the shell of one potato that they had hollowed out. While assorting potatoes a few days ago I found many alive; also what I believe to be deposits of their ova. By informing me of the name of the insect you will greatly oblige many farmers and gardeners.—[W. S. Young, Woonsocket, Dak., March 1, 1889.

REPLY.—I beg to acknowledge the receipt of yours of the 1st instant and the worms sent in the accompanying box. They belong to one of the common Western species of "thousand-legs," and judging as nearly as I can from the crushed specimens received they are the *Iulus virgatus* of Wood. Your account of the extraordinary abundance of this insect is very interesting, and I have seldom heard of a similar case. Your only plan will be to attempt to trap them on a large scale by placing slices of potato poisoned with Paris green in spots where they are most abundant. This course will occupy considerable time and will be quite troublesome, but it is the best recommendation I can make. If you adopt this plan please let us know of its success.—[March 18, 1889.]

The Bean Weevil in California.

At a meeting of our Horticultural Society held to-day, Mr. O. N. Cadwell exhibited specimens of beans from his place in Carpinteria showing the ravages of an insect new to us, and I have taken the liberty of sending you a few of the beans with the insects for you to identify. Mr. Cadwell thinks they were introduced in the "Golden Wax" bean during 1887, but he does not remember where they came from. The insect is discovered while the beans are yet in the pod and just beginning to ripen. They attack the "Limas" and all other varieties as far as observed. As the raising of "Lima" beans is an important industry with growers in the Carpinteria Valley, they are naturally nervous about this new enemy. I have no doubt you are familiar with the pest and can enlighten us about it. * * *—[H. C. Ford, Santa Barbara, Cal., February 6, 1889.

REPLY.—Your letter of February 6, with specimens, has been received. The insect which is damaging beans at Carpinteria is the common Bean Weevil (*Bruchus obsoletus*). It will not be necessary for me to write you at length concerning this insect, as Mr. Matthew Cooke in his work on the "Insects of the Orchard and Vineyard" has compiled a short account of it from my writings, accompanied by figures, upon page 334, under the name of *Bruchus fabæ*.—[February 18, 1889.]

Method of mounting Eggs of Insects for progressive embryologic Study.

* * * I mail you to-day a slide of newly hatched larvæ of *Arctia virgo*. * * * Possibly you may be interested in the method I use in observing the development of the embryo, which is simple and consumes but little time, though probably used by others, although devised by myself. In summer evenings, when moths fly into the house I capture them, placing each in a pasteboard pill-box three-fourths of an inch deep and 1 inch in diameter, marking the cover with a reference letter and, under this letter, entering in a record-book date of capture. If a female, I usually find next morning a number of eggs, which I distribute equally into a number of homeopathic phials each about 1 inch high, placing the same reference letter on the corks and numbering the corks from 1 upwards. Then I fill No. 1 with carbolic acid on the first day; No. 2 on the second, and so on until the last day I fill a bottle containing the newly hatched larvæ. I find the acid renders the eggs perfectly transparent, so that the embryo can be observed in various stages of development. I mount in benzole balsam direct from the carbolic acid, the larvæ sent you being prepared by this process. * * *—[Edwin A. Hill, Cincinnati, Indianapolis, Saint Louis and Chicago Railway Company, Cincinnati, Ohio, March 4, 1889.

Grass Cut Worms.

I send you by this mail three specimens of the worm, or grub, that is doing great injury to lawns in this city. I have not heard of them elsewhere. Although somewhat familiar with the habits of the worm, having seen it work in other States, I do not know its name. It works immediately under the ground, feeding entirely on the roots. It appears to move in a body, and the first indication of their appearance is dead grass, and the sod in such places to the depth of nearly one-fourth of an inch can be rolled up. What is the remedy, and must lawns so destroyed be plowed up? My investigation so far convinces me that the grubs or cut-worms destroy the sod entirely, and in that case re-seeding seems to be the only alternative. You will greatly oblige me by giving me a report for publication in the Northwestern Farmer.—[E. A. Webb, Fargo, Dak., June 30, 1888.

REPLY.— * * * Your box on receipt was found to contain three cut-worms, one of which had been destroyed by the other two. The remaining two belonged to entirely different species. The whitish worm with a brown head is the so-called Glassy Cut-worm (*Hadena devastatrix*) which was treated in the Annual Report of this Department for 1886, on pages 578 to 580, as injuring timothy in Indiana. The larger darker worm with dark stripes is the so-called Bronzy Cut-worm (*Nephelodes violans*). This worm was curiously enough found working with the Glassy Cut-worm in Indiana as mentioned in the article above referred to. It has been known to entomologists for a long time, but has seldom done any particular damage. If you have the 1886 Report at hand you will see that the damage done is almost precisely similar to that which you describe. It is altogether likely that the main perpetrator of the damage is the Glassy Cut-worm. The course to be pursued will depend upon circumstances to some extent. As soon as the damage is noticed, and it will probably be confined to a definitely limited spot, this spot should be inclosed within a furrow and the worms killed as they collect. Moreover, if the spot is small I would try drenching it with a dilute emulsion, as this course has been found to be effective against the white grub which works in lawns in a somewhat similar way. If, however, a large lawn has been neglected until it is almost entirely destroyed, it might as well be plowed up at once and chickens and hogs turned in to feed upon the worms.—[July 6, 1888.]

Another Proposition in regard to Chinch Bug Remedies.

I have lately discovered a remedy by which the Chinch Bug trouble may be greatly diminished, if the idea can only be brought before the farmers generally and induce them to act accordingly. I hope you will give the plan your recommendation, and have it published in the leading agricultural papers, and get the attention of farmers drawn to the subject as much as possible. The following is the plan given in brief:

That each farmer sow a small field of rye in the fall for early spring pasture; they should turn stock on it in the spring as soon as the bugs commence flying, which is towards the last of March or first of April; keep it pretty well grazed until nearly time for the young bug to hatch out, which is about the 20th of May. Then it should be all plowed under, leaving nothing for the young bugs to eat when they are hatched out. The Chinch Bug wants nothing to eat while in the egg state; but soon after being hatched they must go to eating, and can't travel far before eating their first meal—only a few feet at the farthest and they are done. That these things are facts and also that the grazing will draw the bugs to the field I have the most positive evidence, and might relate the circumstances by which I came to find it out. But not wishing to bother you with so long a letter I omit it. I will give it yet in another letter if desired, as it might give others a chance to experiment and find out still more on the subject. My plan will certainly commend itself to farmers as a saving, by drawing the bugs *from* their pastures instead of *to* them. If the bugs are numerous, as they were here this spring, it will not do to put the rye-field that has been plowed under in corn unless very late, for by that very mistake I am now losing my corn crop.

Some may not like my plan on account of losing the use of the rye field the rest of the season; but it might be put in such things as tobacco or potatoes that Chinch Bugs do not eat; and better lose it entirely for the season than lose a crop as some of us are now doing in this vicinity. I do not claim that all the bugs will lay their eggs in the grazed rye-field and none in the wheat; but I do claim the grazing will draw them and vastly diminish the evil.—[David M. Scribner, Hickman's Mills, Jackson County, Mo., July 7, 1888.

Two Chinch Bug Appearances the past Year.

* * * You asked me to give you a history of the Chinch Bug in this locality. * * * They appear on the small grain, wheat and oats, in May, and when that crop has been harvested they go into the corn. They sometimes totally ruin a large field of wheat or oats, and I have seen as much as one acre in one place wherein they killed every stalk of the corn after it had silked and tasseled. They must lay from two hundred to five hundred eggs each, and in three weeks from the time the eggs are laid the bugs are grown or capable of doing as much damage as they will ever do. I have seen more than one million on a place 60 feet square. They acquire wings at four or five weeks old and fly away, but they always leave a host behind them, which stay until frost. I find plowing the corn as often as possible the best means of checking them, as by that means a great many of the eggs are covered up and the smaller bugs killed. Light, sandy lands are not troubled with them after June 1, as they make their way into the earth in the middle of the day, and the sand gets so warm by about June 1 that they can not live in it. They do most damage on clay and slaty lands, and stay with us in winter by hiding themselves in rotten wood, boards, old stumps, and on rough stubble lands. A bug called the Lady-bug is thought by some to be connected with them in some way, as they invariably go before the Chinch Bug. The Lady-bug is a red-speckled insect about the size of a small field pea, and the Chinch Bug is smaller than the smallest grain of wheat. In their first stage they are red, in the second stage black, and in the third stage they acquire wings of a whitish color and then they fly away from one place to another and deposit more eggs.—[J. F. Myers, Chesterfield, S. C., June 22, 1888.

I have the honor to inform you that the Chinch Bug is now putting in an appearance, locally only, so far, but very numerous. Barley, of which there is but little grown, however, is destroyed almost completely, and the bug is attacking some corn fields. Wheat is too far along to be damaged by them. The 17-year locust has also appeared, but confines its ravages to the woods so far. We do not anticipate any trouble from them.—[Paul Lachmund, Sauk City, Wis., July 9, 1888.

The Texas Heel-fly.

I will as soon as possible send you some specimens of screw-worms. If the fly will deposit her eggs in pieces of meat there will be no trouble, but I am told she does not do this. You appear to have misunderstood my letter in regard to the Heel-fly. I thought I stated plainly that the fly did not directly injure the animal. The injury is the result of the annoyance caused the animal. A cow will be quietly grazing, when suddenly she will spring forward, throw up her tail and make for the nearest water at a headlong gait, seemingly deprived for the moment of every instinct except the desire to escape, so that they will rush over a high bluff, if in their way, often being killed by the fall. This, with miring in water holes and the fact that they are prevented from feeding, causes the loss. The fly may appear any time after the last of December whenever we have a few warm days, and will remain until May if the weather is such that comparatively cool days occasionally alternate with warm, but once the weather becomes settled, they disappear. I can find no one who has ever seen any larvæ in the heel. That they attack the heel seems certain from the fact that the animal is satisfied the moment it reaches even shallow water. It has been

described to me as resembling the nit-fly or bee which deposits its eggs on the hair of horses. I shall forward specimens as soon as possible.—[George Wolf Holstein, Box 45, Albany, Texas, February 14, 1888.

REPLY.—* * * I have now for nearly three years been aware of the fact that the Heel-fly is a distinct and well-known species, and that it really lays its eggs upon the heels of cattle. It is closely allied to the Warble-fly of the Ox (*Hypoderma bovis*), belonging in fact to the same genus, and in general appearance it resembles this species very closely. It is the *Hypoderma linearis* of Villers. This determination has been corroborated by our best American authority upon Diptera, Dr. Williston, of New Haven, and the specimens were received from Mr. W. F. M. Dickson, of Milford, Texas. You are right in saying that the fly will not deposit her eggs in a piece of meat or in a raw spot on the animal. The eggs are unquestionably laid near the heel among the hair, and my desire is now to get hold of authentic specimens of the larvæ or maggots. The very fact that cattle fear this fly so terribly, and run to mud and water to cover their feet and legs, indicates that the attack is exclusively in the vicinity of the heel. I shall be very glad to get further specimens of the fly, and if the maggots or grubs, or larvæ can be obtained they will be of the greatest value. The Screw-worm of which you speak is the *Lucilia macellaria*, and this insect is well known to oviposit only upon raw places, such as open wounds.—[February 28, 1888.]

Insect Injuries in Ohio for 1888.

In looking through my berry patch I found that nearly every raspberry cane had been stung by the Snowy Tree-cricket (*Œcanthus niveus*). So abundant were they that the canes were very seriously injured. * * * I found one cane 22 inches long which contained three hundred and twenty-six eggs by actual count. In another I counted fifty eggs in a little less than an inch. This fall they seem fully as abundant and do not confine their depredations to raspberry alone, but have used the tender shoots of some plum grafts which I had in my nursery, and these are nearly ruined; they are decidedly on the increase with us and will have to be dealt with very severely in order to check their ravages.

Another pest which seems on the increase is the Grape-vine Leaf-hopper (*Erythroneura vitis* Haw.). In 1888 and the present year they have been very abundant, eating the leaves and causing the foliage to look very brown. There is also a leaf-miner which works in grape leaves, nearly every leaf having one or more of their paths in them. I have not reared the insect, so can not describe it.

The Hog Caterpillar (*Philampelus vitis* Haw.) and another (*Thyreus abbottii*) were very abundant this season on the grape and Virginia creeper, but I could not find a single one of either species that was not parasitized by a Microgaster.

The Grain Louse (*Aphis granarius*, Kirby) was very bad on oats this season, nearly every head being filled with them. This caused the oats to be light weight, and many straw stacks are green with the heads that were blown over in threshing.

There has also been an unusual abundance of the Currant Worm (*Nematus ventricosus*), the Rose Slug (*Selandria rosæ*), the Strawberry Emphytus (*Emphytus maculatus*), and above all the Cherry Slug. There was a row of the sour red cherry trees which were so badly infested with this pest that the trees looked as if they had been scorched with fire.

The Clover Root-borer has done great damage to clover, eating the tap-root and thus destroying the vitality of the plant. It was very wet during the month of October, and this caused branch roots to form which keeps the clover alive, but not in thriving condition. This is destined to be one of our greatest pests, and from all appearances it has come to stay.

The Cabbage Worm (*Pieris rapæ*) and the Potato Beetle (*Doryphora 10-lineata*) were not any more abundant than usual, and with proper care were kept in subjection.—[W. B. Hall, Wakeman, Ohio, November 26, 1888.

A Boll-worm Letter.

Will you kindly send me the most recent printed matter on fighting the Cotton Boll-worm. We are establishing a branch of our station on one of the State farms in the Brazos River Bottom in the southern part of the State, where cotton grows 6 to 8 feet high, and where this pest will sometimes destroy 100 acres in a block. Will be glad to have you make suggestions in regard to undertaking the work.—[F. A. Gulley, Director State Experiment Station, College Station, Tex., March 27, 1889.

REPLY.—I beg to acknowledge the receipt of yours of the 27th ult. We have done no work here upon the Cotton Boll-worm since the publication of the Fourth Report of the U. S. Entomological Commission, a copy of which you doubtless possess. You will notice from this report that the principal practical remedies are the avoidance of corn crops in the immediate vicinity of cotton-fields; the early worming of neighboring corn; and above all the early poisoning of the cotton crop with Paris green or London purple, as for the Cotton Worm. Some extensive experiments are really needed, and you have a most excellent opportunity of testing particularly this last remedy. It is to a certain extent theoretical, although, as you will notice by the appendices of the Fourth Report, the experiments which have been tried upon a small scale indicate that it will be successful.—[April 1, 1889.]

A remarkable Theory.

Thirty years ago, while going my daily morning rounds to kill the millers that were troubling my honey bees, I found a common grasshopper with his skin cracked open on his back and with a cricket inside the grasshopper's skin. It produced a sensation with me, as I had supposed that the grasshopper and cricket belonged to different genera. I had no books to help me, so I went to work to study the grasshopper family. I soon satisfied myself that the cricket was a pupa. Then the question arose, what was the imago? I found that the flying grasshoppers made their appearance at the time the crickets left, and were full grown when they came and were more nearly like the crickets than the most of imagos are like the pupas from which they come. I satisfied myself that the crickets with their rear stylets could not mate if they wanted to. I ought to have added, for the week following my discovery of the grasshopper changing to a cricket, I saw from one to three in the same condition each day. After two years I found two crickets that had a burrow in my garden, which I resolved to watch. I commenced to work at them on the 10th of July. I went to look after them about every half hour. I watched two or three days and found a flying grasshopper at the mouth of the burrow. It was quite stupid, so that I could pick it up and lay it down. It took it two or three days to get life enough to attempt to fly or to get out of my way. It finally became active. At the time that I found this one I dug into the burrow to look after the other cricket, but it was not there. It had probably been caught by the fowls. But I found a cricket's skin, which was good enough proof to convince me that the cricket had changed to a flying grasshopper. In the printed slip I have given the rule. I will now give exceptions. The rule is given for the three largest species. Three times in the last thirty years, after a protracted season of dry, warm weather, I have seen the crickets of the smallest of the three species of grasshoppers on the 25th of August, otherwise I have not seen any before the end of the first week in September. Another exception is, that after a protracted season of cold, wet weather on bleak hills I have known the common grasshoppers to live over winter before changing to crickets. If you would like to experiment, I would send you a few flying grasshoppers, after they had mated and been fertilized, with the expectation that you could hatch their eggs and produce before spring a crop of crickets which would show all the stages of the insects.

About ten years after making my discovery I got Professor Tenney's "Zoology." I there saw the common grasshopper, the cricket, and the flying grasshopper described as three distinct genera. This produced another sensation, it being the first intima-

tion that I had had that my discovery was an original discovery. I then wrote a similar description to the inclosed printed slip, and sent a copy to Townend Glover, one to Dr. Fitch, and one to Professor Tenney, and asked a criticism from each. I did not get a response from either. Commissioner Watts responded by saying that I was mistaken in supposing that the grasshopper laid eggs and then changed to a cricket. He then gave me the version which I already had in Mr. Tenneys' book. I replied by showing how he had mistaken my statement. That ended that correspondence. Some three years ago I got hold of our State Entomologist's report and read it with a good deal of interest. I then took the liberty of rehearsing my discovery as in this communication, and was told in response that I was mistaken in my deductions, saying that it was not possible for the cricket to change to a flying grasshopper, but that the common grasshopper might. I had made no deductions to be mistaken in. I had simply stated what I had seen. My feeling was that if he was a gentleman he had a queer way of showing it. Our correspondence closed. If it is impertinent for me to try to get a discovery that I have made in natural history before the world, I am unwittingly and unintentionally guilty. Hoping that you will find nothing offensive in this communication, I will subscribe myself with kind regards.—[Archibald Stone, Binghamton, N. Y., August 27, 1888.

Reply.—I am sorry to have to tell you that you have certainly been deceived. You may have found a cricket which had crawled inside a cast skin of a grasshopper, but for the one insect to pass into the other and back again is utterly impossible. You will soon be convinced of this if you will confine one of the insects in a jar or breeding-cage and watch it closely, and see that no other insect has access to the jar. This must be, I think, the way in which you were misled. In watching those in the burrow out of doors and not confined, it was a very easy matter for the insects to get mixed up. Crickets and grasshoppers belong to two entirely distinct families, and so you will at once see the fallacy of supposing one to proceed from the other. In regard to the imagos of crickets, they mate, in spite of their rear stylets, which you will find if you observe them closely.

The young grasshopper has a sort of a general resemblance to a cricket, and after it hatches from the egg it molts periodically, each time the wings becoming more marked until the final molt leaves it with fully developed wings. The specimen will be found to be in a weak condition after each molt, especially the last one. So it is just possible that you have made a mistake in the *identification* of crickets. The specimens which you observed and accepted as crickets may have been the larvæ of the grasshoppers, in which case you have followed the stages correctly. I shall be pleased to receive specimens from you both of the crickets and the grasshoppers, which will at once settle the question.—[August 30, 1888.]

[Printed slip inclosed by Mr. Stone.]

GRASSHOPPERS AND CRICKETS—SEVERAL STAGES OF INSECT LIFE.

Binghamton, *August* 25.

To the Editor of the Republican:

I gave notice in the daily *Republican* on the 10th of July last that in the next ten days all the crickets would change to flying grasshoppers. I will now give notice that all the common grasshoppers will change in the next three weeks to crickets. That the reader will not be confused, I will say that the common grasshopper hatches out of very small eggs about the 1st of June. They eat and grow until about the end of the first week in September, when within the next two weeks they change to crickets. The crickets remain as crickets through the winter and until the 10th of the following July, when they change to flying grasshoppers. The flying grasshopper mates. They remain until October or November, when the females work their bodies down to their wings into the ground and die. Their eggs remain in the tips of their bodies, where they hatch the next spring, the offspring using the bodies of the mother flying grasshopper as a staircase through which to come to daylight.

In the life history of insects the eggs are the first section. The eating and growing section, known as the larva, is the second section. The intermediate section between the larva and the imago, known as the pupa, is the third section. The perfect insect is known as the imago. The whole growth of all insects is made by the larva. Neither the egg, the pupa, or the imago ever grow. Neither do either of the first three sections mate or lay eggs. The common grasshopper is the larva. It never mates or lays eggs. Its whole work is to eat and grow. The cricket never grows, neither does it ever mate or lay eggs. It is the pupa. The flying grasshopper is the imago. It never grows, but mates and lays the eggs. Any one wishing to become a witness to the change that is now to be made can put a box into his pasture where there are plenty of grasshoppers and go to it every morning before sunrise, after the first week in September or during the second week, and he may be quite sure of being gratified. The change of the cricket to the flying grasshopper is effected in the cricket's burrow in the ground and is not so easily witnessed.

ARCHIBALD STONE.

GENERAL NOTES.

LATE IMPORTANT PUBLICATIONS RELATIVE TO THE HESSIAN FLY.

E. A. Ormerod.—Hessian Fly. Report on insects injurious to wheat plants in New Zealand. (4 folio pages, dated April 11, 1888, with a figure of Howard's plow appended on fifth page.)

Karl Lindeman.—Ueber das Vorkommen der Hessenfliege an wildwachsenden Gra'sern. (Entom. Nachr. XIV, No. 16, Aug., 1888, p. 242–243.)

S. A. Forbes.—A new parasite of the Hessian Fly. (*Psyche*, Vol. V, No. 144, April 1888, p. 39–40.)

Fred. Enock.—Parasites of the Hessian Fly. (The Entomologist, Vol. XXI, Aug., 1888, p. 202–203.)

In the above-named articles, which were published within a few months of each other during 1888, several interesting points and new facts in the natural history of the Hessian Fly have been brought out.

After a careful comparison of imagos and upon examination of infested wheat straws, both received from New Zealand, Miss Ormerod declares that the New Zealand insect is indistinguishable from the genuine *Cecidomyia destructor*. This sudden appearance of the Hessian Fly in such a remote part of the globe, coming so shortly after its appearance in England, can not fail to attract general attention. That the insect has been introduced into New Zealand can not, we think, well be disputed, and it is quite likely that such importation took place from England and not from North America. Miss Ormerod seems to have some doubts on this question, since she says:

> I notice a small point about the fly which inclines me to conjecture it is American.

At any rate a study of the parasites, which will no doubt be bred from the New Zealand fly, will definitely settle this question, as it was the case when the Hessian fly appeared in England. It will be remembered that an inspection of the parasites bred in England enabled us to decide that the Hessian fly must have been introduced into England not from North America but from Russia.

Our knowledge of the parasites of the Hessian Fly has been advanced by two contributions: Professor Forbes describes a Proctotrupid (*Platygaster hiemalis*), which he bred from puparia collected in southern Illinois in March. The parasites issued on unknown dates between April 23 and October 18.

Mr. Fred. Enock gives a list of the parasites which he bred in 1887 from the puparia of the Hessian Fly. They are ten in all, three corresponding to American species, five to Russian species, and two undetermined. We are quite certain that the determination of two of the American species is incorrect, but this question we shall discuss elsewhere.

Another interesting and very important question, economically, has been touched upon by Professor Lindeman, viz, that of food-plants of the Hessian Fly other than the cultivated cereals. He first mentions the finding in England of a single pupal case of the fly on velvet grass (*Holcus lanatus*) as recorded by Charles Whitehead in 1887. In June of the same year Dr. Lindeman found in the neighborhood of Moscow two stalks of timothy (*Phlœum pratense*) infested with larvæ of the Hessian Fly; and in June of the year following, 1888, he received information of the injurious abundance of the fly on timothy in the Government of Tambow, together with a large number of pupæ, which he says were undoubtedly those of the insect in question. In 1887, also, he received from Tambow and Woronesh specimens of "quick grass" (*Triticum repens*) containing pupæ of *Cecidomyia destructor.*

Dr. Lindeman thinks there can be no doubt but that under certain conditions, such as the absence or scarcity of the ordinary food-plant, the Hessian Fly may subsist on various wild or cultivated grasses. He makes no mention, however, of having reared the adult flies, which leaves the matter of the correct identification of the insect in some doubt. In view of the importance of this question, further observations are highly desirable.

FUNGICIDES AS INSECTICIDES.

We have elsewhere referred to the fact that Colonel Pearson, of New Jersey, discovered that the lime and copper sulphate solutions used against the Grape Mildew were also efficacious against the Rose Bug, and our attention has been called by a note in the *Rural New Yorker* for March 23, 1889, to the effect that F. Bascarolli, a grape-grower in the Tyrol, shows that this same substance is very injurious to locusts and to garden snails.

KEROSENE-SOAP EMULSION AS FUEL.

It is stated that Dr. Kauffman, a Russian experimenter, has succeeded in solidifying petroleum to be used as fuel, by heating it and mixing it with from 1 to 3 per cent. of soap. The latter dissolves in the oil, and the liquid in cooling forms a compact mass having the appearance of

cement and the consistence of tallow. The product is difficult to inflame, but when lighted burns slowly and without smoke, developing a high temperature, and leaving only 2 per cent. of a hard black residuum. —[*Engineering*, July 27, 1888.

NEW FOOD-PLANT FOR THE SCURFY BARK-LOUSE.

Mr. John R. Matlack, of Fort Washington, Pa., sent us specimens of currant twigs of the "cherry-currant variety" completely covered with female scales of *Chionaspis furfurus* Fitch. He also wrote that all the branches were covered in a similar way. This appearance of this scale upon Currant was to be expected, but was not previously recorded. The food-plants previously known are as follows: Apple, Pear, Choke-cherry, Crabapple, European Mountain Ash, and Black Cherry.

OBITUARY.

We are much pained to learn of the death of Samuel Lowell Elliott, Ph. D., which occurred at his residence in Brooklyn February 12. Dr. Elliott was forty-five years of age at the time of his death and had for a long time been well known as a careful student of the habits of insects, and was a remarkably ingenious man in the way of contriving successful methods of rearing and studying living insects. He was born in Plattsburgh, N. Y., and was the only son of Dr. W. H. Elliott, of that village. He was a member of a number of scientific societies, among others the Entomological Society of Washington.

PRECURSORS OF BROOD VIII OF THE PERIODICAL CICADA.

Prof. William A. Buckhout informs us, under date of February 23, that three adult Cicadas appeared in his greenhouse during the last week. The greenhouse was built about eighteen months ago and its site was formerly covered by an irregular growth of nursery stock.

A SPIDER-EGG PARASITE.

Mr. Henry C. Wells, of Short Hills, N. J., sends us, February 24, a cocoon of the common *Argiope riparia* from which had issued three female specimens of the Ichneumon, *Pimpla inquisitor*, which we had previously bred from a number of Lepidopterous larvæ. The *Argiope* cocoon was full of the cocoons of the parasite. As many as twenty could be plainly counted. They were about 10 millimeters long by 3 millimeters in diameter, and were composed of rather loose pure white silk, closely covered with the loose reddish-brown silk of the spider. The spider eggs had been entirely consumed and only slight traces of them remained.

SPRAYING FRUIT TREES.

The testimony of experimenters is not entirely in favor of this remedy. Mr. W. A. Smith, of Berrien County, Michigan, reports in *Popular*

Gardening for March, 1889, that he sprayed his apple trees once last year and that nine-tenths of the fruit were wormy. No particulars are given, but the instance is worthy of record.

It is but fair to state, however, that Mr. Smith also states that for the last two years he has found that a single spraying saved his cherries, and also that four or five applications have done the same for his plums.

WHITE GRUB IN STRAWBERRY BEDS.

Mr. M. T. Thompson (*Popular Gardening*, March, 1889) finds that plenty of manure and thorough working of the land will greatly reduce the numbers of the white grub. He understands that hog manure will not answer the purpose.

FARMERS AND STOCK-RAISERS' INSECT SOCIETY.

We learn that a meeting of farmers and stock-raisers was recently held at Duquoin, Ill., intended primarily to take some action regarding the Chinch Bug and also to form an organization for the study of the habits and the best means of fighting insect pests in general, where concerted action seemed to be needed. Mr. E. M. Harris, of Duquoin, was elected president, and a board of directors was chosen composed of one farmer from each of the eight precincts of the county. County organizations of this kind are most desirable, as they will bring about a concert of action which can not be arrived at in any other way.

A BRYOBIA IN NEW ZEALAND.

In our March number we published a communication by Mr. Webster concerning a mite of the genus Bryobia, which has been infesting houses in Indiana and other parts of the country. We learn from the *New Zealand Farmer* for February that a congeneric insect is damaging the leaves of the apple in New Zealand.

THE BOX ELDER BUG.

In Bulletin No. 12 of this Division we published an account of damage to apples by *Leptocoris trivittata* in Utah, and stated that our correspondent wrote " that they had appeared upon the box elder shade trees." During the past season we have heard of their occurrence in great numbers in Utah and Nebraska, and notice in the Kansas *Industrialist*, for March, 1889, an article by Prof. E. A. Popenoe, in which he figures the insect in all of its stages and gives an account of its habits. He has observed it feeding upon a number of plants, but upon none of much economic importance.

THE FLORIDA WAX-SCALE IN CALIFORNIA.

We have recently received a letter from Mr. W. E. Collins, the Secretary of the Board of Horticultural Commissioners, of San Bernardino

County, Cal., inclosing us specimens of a scale insect which were taken from trees imported this season from Florida, and which prove to be the well-known Wax-scale of Florida (*Ceroplastes floridensis*). It has not previously been reported from the State of California, and Mr. Collins writes that the specimens are the first of the kind that have been seen in San Bernardino County. Up to the present time the species has been supposed to be confined to the State of Florida, where its principal food plant is the Gall-berry (*Ilex glabra*), a plant which grows wild in the flat woods and in low grounds about ponds. It also lives and thrives upon Quince, Apple, and Pear, and occurs everywhere upon the Orange, but usually in insignificant numbers. It is not noted as a pest in Florida, but occasionally it will increase upon an individual tree so as to arouse apprehension. It is readily killed by the kerosene emulsion spray, which should be applied while the majority of the insects are young.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

March 7, 1889.—Judge Lawrence Johnson presented a paper on the "Jigger-flea of Florida," giving an account of its life-habits, and the damage which it causes to young poultry. The best preventives are cleanliness and keeping the young chickens away from dry, dusty places that are protected from rain.

Professor Riley spoke of some Microgasters affecting Rhopalocera, dwelling upon the great variability of the species and the difficulty of finding specific characters. He considers the sculpture, especially of the scutellum, as affording the best character. He identifies *Microgaster pieridis* Pack. as *Apanteles glomeratus*, although the American form differs in the leg coloration.

Mr. Marlatt read a paper on *Lycæna comyntas*, referring to an immense swarm of these butterflies noticed flying about an elm tree at Manhattan, Kansas. Other instances of the swarming of butterflies were mentioned in the discussion.

April 4, 1889.—Mr. M. L. Linell was elected an active member, and notice was given that the third number of the Proceedings had been issued. A letter was read from Baron C. R. Osten-Sacken, inclosing a note for publication entitled "Correction to the Monographs of the Diptera of North America, No. 1, Washington, 1862."

Dr. Marx read a paper called "Some spiders from the Galapagos Islands." This paper was based on the collection made by the scientific force of the steamer *Albatross*, and nearly all of the spiders were new. This paper gave rise to a discussion on the value of insular faunæ in the light of the theory of evolution.

Mr. Schwarz read a paper on "Vitality of Insects in Cold Water." His observations were made on the shores of Lake Superior, where, under certain conditions, immense numbers of insects are sometimes washed ashore. He explained this phenomenon, and presented a tabular statement of the condition of insects of different families.

Mr. Howard presented a note on the "Mouth parts of the Cockroach," describing in detail these parts and calling attention to a formerly unnoticed sclerite.

WILLIAM H. FOX, M. D.,
Recording Secretary.

SPECIAL NOTES.

Australian Enemies of Icerya in California.—Mr. Koebele writes under date of April 4 that he has just visited Los Angeles, and finds that many of the Australian Lady-birds have escaped from the tent in which they were confined and have made themselves at home on the neighboring trees, where he found not only numerous eggs but also nearly full-grown larvæ. Within the tent they were swarming in great numbers, eggs, larvæ, pupæ, and beetles. The Lestophonus seems to be developing very slowly; only young larvæ were found within the scales, yet many were infested.

We have just received, through the kindness of the author, the second edition of Saunders' Insects Injurious to Fruits. The volume is but two-thirds the thickness of the first edition, but, being printed on thinner paper, contains the same number of pages, and the price has been reduced from $3 to $2. In the preface to the second edition the author states that he has endeavored to make such corrections and embody such additional facts as will bring it into accord with our present knowledge of fruit enemies. We are sorry to notice, however, that some points are partially overlooked, or might with advantage have been a little more elaborated; but this is a matter of expense and is settled between author and publisher.

As a whole, the work is a most excellent compilation, and absolute errors are rare. We will call attention to two only. The one occurs on page 131, where it is stated that the application of Paris Green deters the Codling Moth from laying her eggs on the apple, and the other on page 400, in the statement that the adult female of *Icerya purchasi* is covered by an egg-sac.

The first edition appeared in 1883, published by J. B. Lippincott & Co.; the second edition, 1889, same publishers. As a compilation of matter of much value to fruit growers, interspersed with the author's own experience, this work serves an important purpose.

Catalogues of Oriental Insects.—Our esteemed correspondent in Bengal, Mr. E. T. Atkinson, C. G., Accountant-General of the Treasury at Calcutta, has undertaken the gigantic task of preparing catalogues of the Class Insecta belonging to the Oriental Region. It is intended to include therein all described species up to date. These catalogues will be of great use to workers everywhere. The first one, which embraces the Cicindelidæ, Mr. Atkinson writes us, under date of March 12, will appear in a few weeks.

A new Government Publication.—We have received the first number of the Journal of the Board of Viticulture, a publication just inaugurated by the Agricultural Department of the colony of Victoria, Australia. This first number is a small octavo of 80 pages and contains the minutes of the proceedings of the Board of Viticulture for Victoria, an account of a conference of vignerons, held in August, 1888; of a conference of fruit-growers held in September, 1888; a number of papers relating to vine-growing in California and the British colonies, and a notice of a proposed college of viticulture. The number contains considerable matter of interest to entomologists, and we notice that in the discussions it seems to be an accepted fact that the Grape-vine Phylloxera has obtained a hold in Australia. There is also the report of some discussions regarding the appointment of a qualified entomologist and of the introduction into Parliament of an insect pest act. The journal is to be published monthly at the expense of the government, provided the vine-growers show their interest in the matter by joining a central vine-growers' association, and subscribing to the association half a guinea annually.

NOTE ON THE GENUS LESTOPHONUS.*

By S. W. WILLISTON, M. D., *New Haven, Conn.*

In the abstract of the Proceedings of the Linnæan Society of New South Wales for February 27 of the present year Mr. F. A. A. Skuse states that he has recognized two species in what I had erroneously considered one, and described, rather too briefly I may say, as *Lestophonus iceryæ.* He is also of the opinion "that the genus *Lestophonus* can be included in the family *Oscinidæ* only as an anomalous genus. Not only is the arista of the antennæ entirely wanting, and the anal cell

* This genus *Lestophonus*, it will be remembered, was erected by Dr. Williston in No. 1 of the current volume of INSECT LIFE for the Australian parasite of *Icerya purchasi*—the Fluted Scale of California. It is the same parasite which Professor Riley has had imported into California in such numbers from Australia during the past winter months. The question of the identity of the form bred from Monophlœbus and that bred from Icerya is of extreme practical importance for the reason that owing to the comparative rarity of Icerya in Australia a large portion of the Lesto-

present, but a rudimentary auxiliary vein is visible and a pale posterior basal transverse vein exists."

Happening to be in Washington recently, I gladly availed myself of the opportunity to carefully examine all the material of this genus in the Department collection, which examination enables me to discuss more intelligently the character of both genus and species than was possible from the three not too well preserved specimens that I had previously studied. Mr. Skuse is quite right in considering the genus an anomalous member of the *Oscininæ.* My reasons for placing it there were chiefly neurational ones, to which, with Schiner, I am inclined to attach much importance. Notwithstanding Mr. Skuse's assertion I will repeat that the auxiliary and anterior basal cross-veins are entirely wanting, as Mr. Skuse will, I think, see by mounting specimens of the wings in balsam. By reflected light there does appear to be a rudiment of the

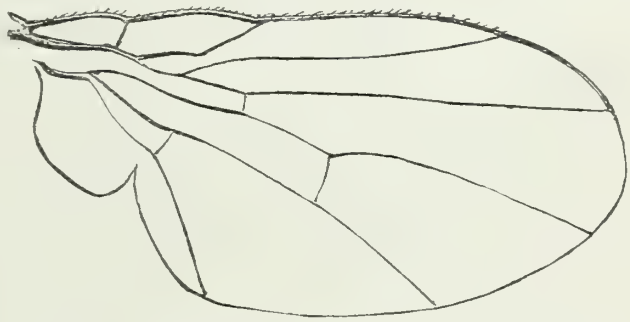

FIG. 72.—*Lestophonus iceryæ:* wing venation.

auxiliary vein, very similar to the fold seen in many species of *Oscininæ*, running forward from the humeral cross-vein and becoming obsolete. I am not sure what Mr. Skuse means by the statement that there is a pale posterior basal transverse vein. Such a vein is distinct, otherwise there would be no anal cell. If "posterior" is a lapsus for anterior, however, I must differ with him—the second basal and discal cells are wholly confluent. But, notwithstanding these peculiarities, which seem characteristic of the *Drosophilinæ* and *Oscininæ*, I believe now, after a more careful study of allied forms, that the relationship of the genus is with the *Ochthiphilinæ* of Schiner, somewhere in the vicinity of Leucopis. It is true that Loew's definition of the *Agromyzinæ* will wholly exclude this form, but so will it exclude other genera that Loew includes in this group—there are no vibrissæ, the front does not have strong bristles, and the anterior basal cross-vein is wanting; furthermore there are no bristles on the under side of the first femora, and the peculiar exserted genitalia are different; nevertheless I would place the genus provisionally here.

phoni imported were taken in Monophlœbus on the supposition that they were specifically identical with those infesting Icerya. The abstract of Mr. Skuse's paper was sent to Professor Riley by Mr. Frazer S. Crawford, and arrived after Professor Riley's departure for Europe in April. Fortunately Dr. Williston was in Washington at the time, and made a careful examination of all the material at the Department, and wrote this note at our request.—L. O. H.

As regards the specific differences, I can assure Mr. Skuse that there was but *one* species in the specimens I described, nor can I find satisfactory evidence of more than one in the material in the Department collection, including nearly fifty specimens. Nevertheless, I will by no means say there may not be two. In the examination of an abundance of fresh material, Mr. Skuse is in a far better position to discuss such characters than I am. That what was considered *L. iceryæ* was bred from both Icerya and Monophlœbus might lead one to suspect two forms, but would not be a strong evidence in itself. The same species is frequently parasitic on different, sometimes numerous, hosts. The specimens examined were bred from both Icerya and Monophlœbus.

There is a minute variation in the shape of the antennæ. In many specimens the third joint is rounded on the distal end, in others subangulated in front below, almost as figured. The face, when the antennæ are removed, shows two subantennal grooves, separated by a low ridge and reaching to the oral margin. The size of the shining frontal triangle is a little variable; on either side the opaque orbital triangle may be somewhat reduced in size. Along the vertical margin of the occiput there is a row of short delicate bristles. In the thorax, abdomen, or wings I can discover no differences, except minor colorational ones. The feet, in specimens that I suspect are immature, are yellow, whereas in others they are luteous or even darker. None of these differences would I consider other than varietal in the absence of better evidence.

A matter of greater interest at present is the geographical distribution of the genus and the validity of the present generic name.

So far as the material at my command permits I feel better satisfied with the species than with the genus. In my search for the genus I overlooked Rondani's description of Cryptochœtum, Rondani (Bull. Soc. Ent. Ital., 1875, 172), to which my attention was called later by Mik's suggestion of the relationship. The characters, as given by the author, though not very complete, apply well, as will be seen. Still, as the name is already proposed, it will be premature to withdraw Lestophonus until we have further information of Cryptochœtum. Especially would I call attention to the peculiar genitalia here figured, no reference to which is made by Rondani, though he knew both sexes.

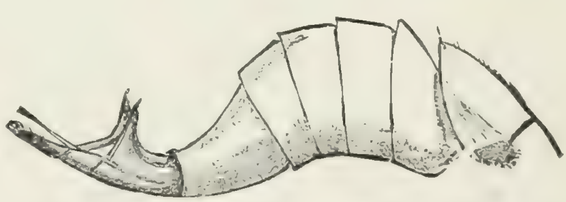

FIG. 73.—*Lestophonus iceryæ:* male genitalia.

His generic description is as follows:

Cryptochœtum.

Antennæ articulo ultimo latissimo et ad epistomium elongato, præsertim maris maximo, subquadrato, arista in utroque sexu abortiva, indistincta—Oculi nudi—Frons puberula, non setosa.

Alæ margine antico non secto; vena costali ad apicem tantum tertiæ longitudinalis, non ad quartam producta; areola basali antica incompleta; vena ultima postica ex-ilis sed distincta. Femora omnia non incrassata.

Sp. *C. grandicornis*. Raro in floribus Euonimi europei, in collibus subapenninis ditionis parmensis eum legi.

THE CORN WORM OR BOLL WORM IN CALIFORNIA.

By D. W. Coquillett, *Los Angeles, Cal.*

In the Fourth Report of the United States Entomological Commission, pages 355 to 384, Professor Riley has given an exhaustive account of the Corn Worm or Boll Worm (*Heliothis armigera* Hübner). During my residence in California I have made a few observations upon this insect not recorded in the above report.

While the normal habit of the full-grown larva is to enter the earth to pupate it does not always follow this course. On the 9th of October I found three chrysalids of this species in ears of corn, and on the 8th of the succeeding month I found a fourth chrysalis in a similar situation. On the 7th of November a moth issued from one of the chrysalids first mentioned, so there is no doubt of the identity of the species.

Besides garden geraniums I have also found the larvæ feeding upon the blossoms of a wild sunflower (*Helianthus* sp?) and upon the seed-pods of *Malva borealis*, as well as upon those of a leguminous plant commonly known as "bitter-clover," also upon the leaves of Cabbage, Grape, and Pear, and I found a half-grown larva feeding upon a green pear into which it had already eaten a large cavity. In the same tree were two other larvæ of this species.

In the work above mentioned Professor Riley records having bred from Boll Worms two species of *Tachina* flies—*T. aletiæ* Riley and *T. anonyma* Riley. On the 1st of June, 1888, several Tachinid larvæ issued from some of these worms, which I captured in Los Angeles, and soon afterward pupated; the flies issued on the 14th of the same month. Specimens of these flies were submitted to Professor Riley for identification, and under date of February 14 he writes me as follows concerning them:

> I have glanced at the *Tachina* from *Heliothis armigera* and find that it differs from *T. anonyma* and it does not seem to be represented in the Museum collection.

The species is an interesting one on account of the great difference in the arrangement of the bristles on the head and abdomen in the different sexes; so great, indeed, is this difference that no person not familiar with the facts in the case would ever suspect that the two forms are but the opposite sexes of the same species. That they are such, however, there can be no doubt, since I bred both forms from the same lot of larvæ and also captured three pairs united in coition. The species is evidently

new to science, and in order that it may be recognized in the future, I append the following detailed description of it:

Tachina (Masicera) armigera n. sp.

MALE.—*Front* narrow, scarcely half the transverse diameter of the eyes, frontal vitta blackish-brown, sides of front with yellowish cast, furnished with a single row of bristles, the upper three or four of which are well differentiated from the lower ones, the latter descending on sides of face a little below base of the third antennal joint. *Antennæ* black, second joint short, third joint narrow, of nearly an equal width, fully three times as long as the second; arista naked, thickened on its basal third. *Face* silvery gray, lateral margins less than half as wide as the median fovea, the lateral ridges with bristles extending nearly to lowermost of the frontal row, the vibrissal bristle a little above the epistomal margin. *Palpi* yellow. *Eyes* bare. *Mesonotum* gray pollinose, with four well-marked shining stripes. *Scutellum* black, gray pollinose, furnished with six marginal bristles, the pair at the apex stout, a pair of smaller ones in front of them. *Abdomen* elongate-ovate, black, mottled with gray, sides of second segment except narrow posterior borders, and sides of third except the posterior third, reddish, apex of last segment sometimes also reddish; first segment with a median posterior pair of bristles, second segment with three pairs, the intermediate ones poorly developed, third segment with two pairs and the usual posterior row, fourth segment and lateral margins with the usual bristles, remaining vestiture of abdomen composed of quite long, recumbent bristles, but the abdomen can not be said to be hirsute. *Legs* black, bristly, front tibiæ with a pair of apical bristles and with a single one on outer side below the middle, hind tibiæ feebly ciliated, pulvilli and ungues elongated. *Wings* grayish hyaline, outer posterior angle of first posterior cell rounded, destitute of a fold continuation of the fourth vein.

FEMALE.—Differs from above description of the ♂ only as follows: *Front* broad, equaling transverse diameter of the eyes; crown with two additional bristles outside of those in frontal row. *Antennæ* with third joint less than three times as long as the second. *Abdomen* grayish-black, first-segment and posterior end of the second and third clearer black, sides of second and third segments concolorous with rest of abdomen; dorsum of abdomen with no bristles except a posterior pair on the third segment, those at apex of the last one and on the lateral margins. Length 6 to 8^{mm}.

Described from 2 ♂ and 3 ♀ bred from *Heliothis armigera* Hüb. at Los Angeles, Cal., and 9 ♂ and 3 ♀ captured at the same place, three pairs captured while united in coition.

Professor Riley, to whom I am indebted for a revision of the above description, writes me as follows concerning the generic position of the above species:

This species, in the elongate antennæ, with the short second joint, and the absence of the fold of the fourth vein, belongs more properly with *Masicera*, but the more elongate abdomen and the differences in the width of the female and male fronts are characters of the true *Tachina* (*sens. str.*). As the two genera run so closely into each other it may be as well for the present to locate it with *Tachina*.

THE SERIMETER.

By Philip Walker.

The first experiments, having in view the determination of the fact that silk is elastic, were made near Paris in 1836. They were executed by MM. Delbare, sr., Paroissien, and Boucher. Two years later, M. Robinet, "Member of the Royal Academy of Medicine and Professor of a course on the Silk Industry," took up the work and it occupied him for several years, during which he announced his results in a series of *memoires.* It is to be regretted that only the first of these, entitled a "Memoire on the Silk Filature," published in Paris in 1839, is at present in the library of the Agricultural Department, for it is, to this learned experimenter that we owe nearly all of the earlier knowledge of the physical properties of silk. He invented the serimeter, the instrument employed in determining the tenacity and elasticity of raw silk. The perfected form of this machine, as used by him, is shown in Fig. 74. It was the outcome of several tentative models described in the memoire cited. The principle of these was one by which a very light cup was suspended to the thread to be tested. This cup carried a pointer which glided along a scale. The silk in place, the cup was gradually filled with sand, the addition stopping only with the rupture of the thread. This apparatus only measured the elasticity.

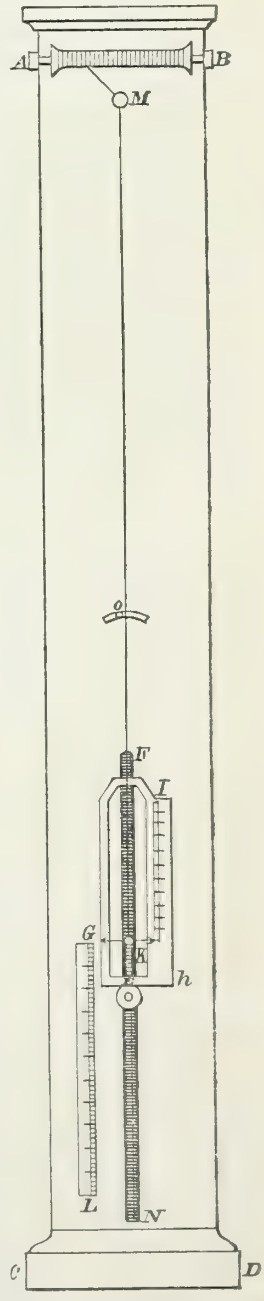

Fig. 74.—Robinet's Serimeter.

After having obtained, by means of the apparatus of the cup and sand, a certain number of results which demonstrated that silks had, to very different degrees, the faculty of stretching, Robinet constructed a more accurate machine of a high degree of sensibility and capable of giving results that might be compared with one another. His first idea was to replace the uncertain and unequal descent of the cup charged with a variable weight by a fixed weight, the action of which would be moderated and regulated by means of a pendulum or balance-wheel absolutely like that of a clock. The silk was attached by one end to a fixed point; the other end was seized by a pair of pincers fastened to a weight which gave motion to a chain wound round the drum of the clock. Then by means of a very simple mechanism of an escapement and a balance-wheel the descent of the weight could be regulated so that each oscillation of the balance-wheel would make it descend one millimeter and stretch

the silk to that extent. This apparatus being completed, several interesting tests were made with it. Later a spring or dynamometer was attached to it on the upper end; this spring, which was extended by the silk attached to it, indicated the weight corresponding to the effort necessary to stretch the silk to the breaking point; it therefore gave the measurement of the tenacity. By means of a very simple arrangement the needles indicating the tenacity and the ductility remained fixed at the point in which they were when the silk broke.

It was, however, soon perceived that this apparatus, although already very satisfactory, was still capable of receiving several improvements, such as a fly-wheel in place of the escape-wheel, which would avoid the little jerks imparted to the silk by the latter. It appeared also possible to avoid certain corrections necessitated by the presence of the dynamometer which let the upper end of the silk descend slightly as it yielded to the effects of the weight. A more perfect instrument was then constructed, for the details of which M. Robinet gives credit to M. Lehodey, a clock-maker of Paris. This instrument he called the *serimeter* * because, as he naively says, "it was necessary to have a name for it to avoid paraphrases."

The construction of this serimeter is shown in Fig. 74: A B C D is a box one meter and a half long. At A B is a spindle on which can be placed a bobbin of the silk which we wish to test; M is a clip which grasps the silk and holds it firmly. K is another clip placed exactly one meter from the clip M. The clip K can slide in the groove N F made in the box, and is fastened, on the interior thereof, to a weight attached to an endless chain. The descent of this weight is made perfectly regular by passing the chain over a sprocket-wheel forming part of a clock-work.

As soon as the mechanism starts the weight decends, drawing the movable clip K towards N and stretching the silk which is fastened to it. At O there is a small and very light lever which rests against the stretched silk. At the moment when the latter breaks the lever acts on the fly-wheel of the mechanism, and stops it immediately. The needle G is attached to the clip K and indicates on the scale GL the number of centimeters and millimeters which the weight has descended and the silk been stretched.

The experimenters thus devised a method of determining the ductility of silk, which was found to be an excellent one when the instrument was well made, ran with perfect regularity, and did not jerk the silk in any way.

But it was not thought sufficient that the serimeter should give the measure of the ductility alone, it must also indicate the weight equivalent to the effort which caused the thread of silk to break; in other words, it must give the measure of the tenacity.

This desideratum was accomplished in the following manner: The

* Silk measurer.

clip K, instead of being fastened directly to the weight of the mechanism, was attached to it by means of a small spiral spring, E; the clip was drawn by the weight through the intermediation of this spiral spring. The weight acting on the spring at E, and the silk fixed in the clip K, resisting this action, the spring was stretched from E to F, and the double pointer G, being movable, was made to rise. The latter indicated on the scale *h i* the extension of the spring up to the moment when the silk broke; for then the spring resumed its original length and drew the clip with it; but the needle being free and drawn by friction only, remained in place and gave the double indication of the ductility and the tenacity, for the divisions of the scale *h i* indicated the number of grams corresponding to the effort necessary to stretch the spring.

Now, it will be observed that this scale was attached to the spring and descended with it, so that, whatever the stretch imparted to the silk, the point to which the spring was attached and its scale were always in the same relative conditions. For a better comprehension an example may be cited: A thread of raw silk is stretched upon the instrument; the mechanism is started; it stretches the silk 150^{mm} and the needle G indicates that figure on the scale GL. On the other hand the spring and its scale have followed the movement of the weight, but the resistance of the silk has stretched the spring and caused the needle to rise, relatively, to the 30-gram point. We have thus a silk of which the ductility is represented by the number 150 and the tenacity by the number 30.

If, now, instead of one thread we take two and fasten them in the clips, the effort of the weight will still stretch them 150^{mm}, but the double resistance which now opposes this effort will be found to have raised the needle to the 60-gram point. This is evident, and the result would have been the same if, instead of two threads, we had employed one having a double tenacity.

The experiment terminated, the clip K is drawn to its initial position by means of a button placed under the spring E.

Such was Robinet's perfected serimeter and its *modus operandi.* The standard serimeter of to-day differs from it, not in principle but in some mechanical details. That employed in the silk laboratory of this Department is shown in Fig. 75, and was constructed by Berthaud, of Lyons.

As in Robinet's second instrument, the dynamometer is on the superior portion of the apparatus at A. In it the spring has been discarded and the tension of the thread is exerted on a pendulum, *c*, which is raised more or less from its vertical position as the tenacity of the silk is greater or smaller. In its swing upward this pendulum carries the pointer *d*, which however does not return with it but is held up by the friction on its axis. This pointer slides along a quadrant on which is engraved a scale of grams, indicating the tenacity of the thread. But,

as the pendulum rises the clip *e*, which is indirectly attached to the bell crank at its upper end, descends. To indicate this descent the quadrant bears a second scale *b*, upon which the same pointer *d* shows the motion of *e* in millimeters. This motion must be deducted from the motion of the lower clip *f* to obtain the real stretch of the silk.

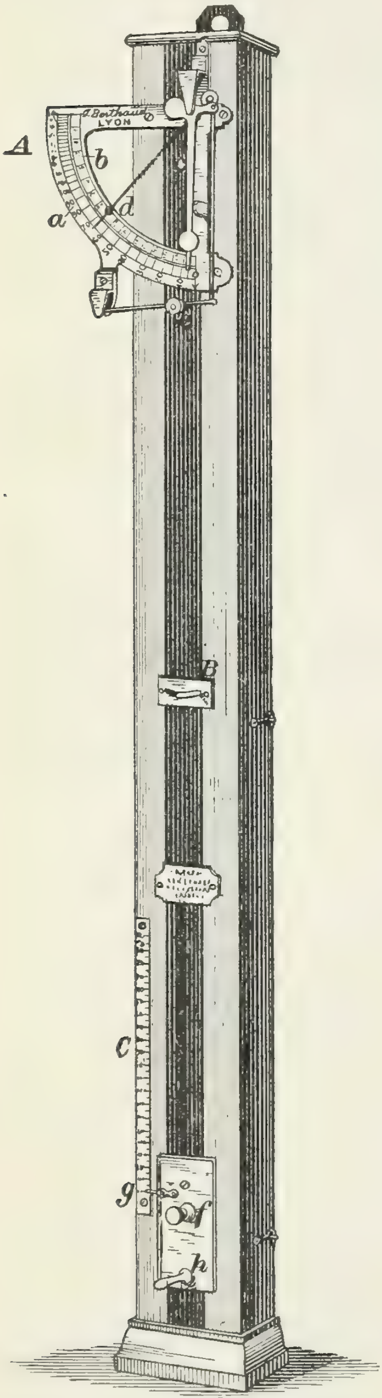

FIG. 75.—Standard Serimeter.

The lower portion of the instrument is similar to Robinet's apparatus minus the dynamometer. The clip *f* carries a pointer *g*, which indicates upon the scale *c* the amount of stretch at the moment of rupture. In the instrument of to-day, however, the distance between the initial position of the clips is but 50 centimeters, and as the scale is divided into centimeters and millimeters the stretch there indicated must be doubled to obtain the per cent. of elongation.

The instrument just described is that used in all conditioning houses to-day. There is, however, according to M. Quajat, Assistant Director of the Italian Experimental Station at Padua, a great difference among instruments in the time necessary for the descent of the weight from the upper to the lower end of the scale, a distance of 200^{mm}. In a recent pamphlet he calls attention to this fact, which is important because the indicated tenacity of a given thread may be altered by varying the time to which it is submitted to the strain. The weights of the serimeters in the following conditioning houses descend (according to M. Quajat) in the following periods of time:

	Seconds.
Milan	15
Turin	14½
Turin (another establishment)	13
Treviso	20
Padua	16
Lyons	16

That in the silk laboratory at this Department consumes thirteen seconds in the descent.

In relation to the instrument in the New York Silk Conditioning Works, the director of that institution writes:

In answer to your favor of the 17th instant, I beg to state that I have tested the serimeter used by us and find as follows: The average time it takes to run from zero to the 200 mark is fifteen seconds; after a thorough cleaning and when everything is favorable it takes twelve seconds, but after a few hours on account of dust the speed is reduced to fifteen seconds, and if very dusty I find as low speed as eighteen to twenty seconds.

This feature of cleanliness opens up a new objection to the present form of serimeter, emphasizing as it does the variability in the time necessary for the weights to descend in the different official serimeters of the world.

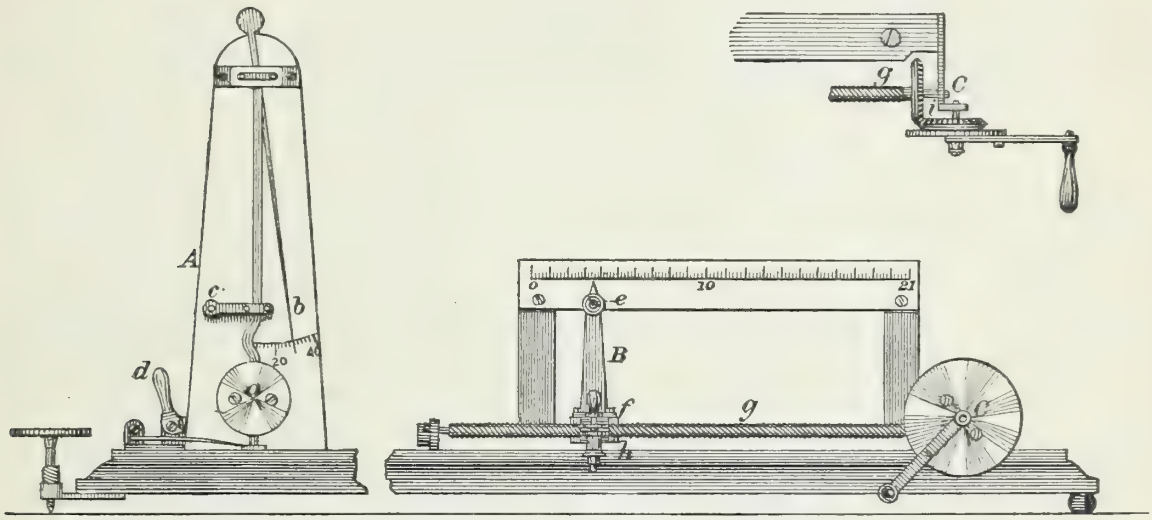

FIG. 76.—Quajat's Horizontal Serimeter.

Desiring therefore to construct a serimeter that would overcome this difficulty, M. Quajat has designed that shown in Fig. 76. This apparatus is horizontal instead of vertical as is usual. It is handier to use and the operator can employ it with less fatigue.

It is composed of two pieces placed upon a base which may be leveled by an adjusting screw. The piece *A* carries a pendulum *a* which draws with it in its movement the pointer *b* which, as in other dynamometers, marks on a quadrant the number of grams by which it has been displaced. To a small clip, *c*, is attached one end of the filament to be tested. This piece is so placed that its level will be as little disturbed as possible during the test. A small stop piece, *d*, holds the end of the pendulum at the zero of the scale and at the same time shows whether the apparatus is level.

On the piece *B* the second end of the filament is caught in the clip *e*, which is exactly 50 centimeters from the clip *c* when all the pointers are at zero. The pointer *f* runs along a scale divided into millimeters and shows exactly the distance which the thread has stretched when rupture takes place. The movement of the pointer is caused by means of a driving screw, *g*, which is turned by a crank which is connected to it through a pair of miter gears, and which has such a pitch that the movement of the hand will advance the pointer 10 millimeters per second. The nut *f* is so constructed that it may be detached by a single turn of the screw *h*, which throws it out of gear with the driving screw and enables us to bring it back to the zero point.*

The mode of compensation for the movement of the clip *c* is exceedingly simple, the pendulum being so adjusted that it will displace that

* This description is translated from the pamphlet already mentioned. The cut is also reproduced from it.

clip just 1 millimeter for each gram of tension exerted, and therefore the number of grams of tension is the same as the number of millimeters of displacement, and both are read from the same scale.

ADDITIONAL NOTE ON THE MEGILLA PARASITE.

By C. V. Riley.

Since the publication of our article on this subject (see p. 101, *ante*) we have received an interesting letter on the subject from Rev. T. A. Marshall, of England, who is monographing the Braconidæ, and to whom we sent specimens. He replies that the species belongs to the genus Dinocamptus of Foerster, which he himself prefers to regard as a subsection of the old genus Perilitus, and that the European species *P. terminatus* (formerly placed in Microctonus by Ratzeburg, Ruthe, and others), the habits of which are so similar to those of our American species, belongs to the same subsection of the genus. Concerning our own species Mr. Marshall writes:

> It differs very little from the cognate European forms, and is interesting to know from your observations that it has similar habits. Its appearance confirms my notion that such a genus as Dinocamptus is useless and should be suppressed; for your insect exhibits at the same time the dividing nervure of Dinocamptus and the abruptly curved radial cell of Perilitus.

Using, therefore, the same specific name proposed in our former article, the species may be described as follows:

Perilitus americanus n. sp.

Female.—Length 3.5^{mm}; expanse 6^{mm}. Head nearly smooth, thorax and first abdominal segment punctate, abdomen glabrous. First cubital areolet separate from the first discoidal; radial areolet ending half way between the wing and the stigma, semi-cordate. Terebra straight. Color black; antennæ dark, pedicel and first funicle joint yellowish; head, except ocelli and included spot and the large occipital black spot, fulvous; middle and hind coxæ black, hind femora dusky, rest of legs honey-yellow; wings hyaline, stigma dark brown, veins a trifle lighter, still lighter in hind wings; most of abdomen dark fulvous approaching castaneous, dark on mediodorsal region.

Resembles the European *P. falciger* Ruthe in venation, but differs in shape of ovipositor and radically in coloration. Differs decidedly in color from the only described North American species—*P. mellinus* Provancher.

Since the preparation of this additional note Messrs. C. M. Weed and C. A. Hart have published in *Psyche*, for April, 1889, an article entitled "Notes on the Parasite of the Spotted Lady-beetle." The authors have found a number of similar cases and, adopting our name of *Centistes americana*, publish a full description of both sexes. They have therefore fallen into the same error of generic position, and their description seems to indicate that they had before them a different species of Perilitus, although on actual comparison of type specimens the differences may prove to be varietal.

William H. Patton calls our attention to the fact that Mr. Glover, in the Annual Report of the Department of Agriculture for 1877, figured upon Plate III (Fig. 43) a Lady-bird parasite which worked the same way, showing a grass leaf with the cocoon under it and the beetle clinging to the cocoon. The parasite itself is figured natural size from the side on the upper side of the leaf. In his text he refers to it in the following words (page 99):

A parasitic insect attacks the *Hippodamia* (*Coccinella*) *maculata* (Fig. 43), the Spotted Lady-bird, in a very similar manner, and was taken in Maryland.

NOTES UPON THE LONGEVITY OF THE EARLY STAGES OF EBURIA QUADRIMACULATA, Say.

By F. M. Webster.

On June 28, 1888, Mr. J. N. Latta, of Haw Patch, Ind., sent me a crushed specimen of this beetle, with the statement that it had been found underneath the carpet in the parlor of Mr. J. R. Copeland, a farmer living near Wawaka, Ind. The carpet, as I afterward learned from the lady of the house, had been taken up and renovated regularly each spring for many years, but nothing of this sort had been noticed until the last time it was removed, when a number of beetles were found underneath, and both the floor and carpet badly eaten. Some weeks later, and after the floor had been thoroughly swept and the carpet had been replaced, another beetle of the same sort had been found crawling on the inside of one of the windows.

Further correspondence with Mr. Copeland revealed the following facts: The floor was composed of hard maple, and had been used in the building fourteen years before. The lumber had been sawed and had laid in the saw-mill for a considerable time prior to its having been used. The house had been constructed upon the present stone foundation, and two feet above the level of the ground. There was no way by which these insects could reach this floor (which by the way is the only one injured in the entire building) other than by way of the windows or by an outside cellar door, about 30 feet away, and leading through a dark alley, this parlor not being situated over the cellar. The room, being the parlor, was not much used and the windows were nearly always kept closed. The floor was not affected more seriously near the edges of the carpet than elsewhere, and the injury did not appear to have been influenced by light or proximity to the cellar door previously mentioned. In short, everything indicates that the eggs or larvæ were in the wood when used, fourteen years before.

April 10, 1889.

EXTRACTS FROM CORRESPONDENCE.

Trumpet-creeper injured by Lygæus reclivatus.

Herewith I send you some specimens of an insect which has appeared in large numbers on a "trumpet-creeper" in this neighborhood. There are no signs of it on any other plant in the garden, but I am told it appears regularly on this one every autumn. I fail to find anything to indicate that these insects were hatched out on the vine, although they may possibly have come to life in the cracks in the wall behind it. I wish to know if it is injurious to vegetation, and whether it should be destroyed or encouraged.—[William Campbell, 328 East Fourth street, Salt Lake City, Utah, October 5, 1888.

REPLY.—The insect in question is one of the plant bugs known as *Lygæus reclivatus* Say. It injures vegetation by puncturing the twigs of plants and sucking the sap. It is found on a large variety of plants, and it is curious that they only affect in your neighborhood the trumpet-creeper.

If you desire a remedy you can do no better than to spray the plants with a dilute emulsion of kerosene and soap, made according to the following formula:

Kerosene	2 gallons	= 67 per cent.
Common soap, or whale-oil soap	½ pound	= 33 per cent.
Water	1 gallon	

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force-pump and spray-nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens on cooling, and should adhere without oiliness to the surface of glass. Dilute, before using, one part of the emulsion with nine parts of cold water. The above formula gives 3 gallons of emulsion, and makes when diluted 30 gallons of wash.—[October 9, 1888.]

Thrips tritici injuring Orange Blossoms.

Inclosed in the bottle which I send you are a lot of insects and orange flowers. These were taken from trees that were badly affected with what we call blight or wilt. The foliage appears as though it were terribly affected with the drought; sometimes the entire tree, but more frequently a few branches. The leaves will fill out during a rainfall, but soon wilt again when the weather becomes fair and cloudless. The foliage soon falls, the limbs becoming bare; the terminal twigs will then die, sometimes back to the body of the tree.—[Robert C. May, Rock Ledge, Fla., April 12, 1889.

REPLY.—The insects which you send, and which were found in the flowers of the orange, belong to the species known as *Thrips tritici.* It received this name from the fact that it was originally described from wheat. Upon orange, so far as we know, it is found principally in the blossoms; in fact, it inhabits all sweet-scented flowers. They appear to feed for the most part upon the stamens and petals, from which they suck the oil. These parts of the flower fall naturally, and the work of the *Thrips* only hastens their dropping. The fruit-producing pistil is usually left uninjured. Ordinarily, therefore, it can not be considered an enemy to the plant, although it may, when occurring in enormous numbers, do some damage. A solution of whale-oil soap in the proportion of 1 pound to 4 or 5 gallons of water will destroy the insects when sprayed upon the flowers in a fine spray.—[April 16, 1889.]

White Ants in Australia.

I am troubled with "White Ants" in my orchard. They are killing some of my fruit trees and vines. Can you in your next issue recommend any preventative or permanent cure that will not be too expensive? They appear to be a common pest

in the Goulburn Valley, and a cheap remedy would be of great service. I have heard of arsenic as being a remedy. Would it be safe to apply a handful of the poison around the roots? Would it be likely to injure the trees?—[George North, Numurkah, Victoria, Australia, January 21, 1889, to Charles O. Montrose, Editor *Victorian Farmers' Gazette*, Melbourne.

REPLY.—Regarding the letter from your correspondent in Numurka, who wishes a remedy for the damage done by White Ants to his fruit trees and vines, I may say that if his determination of the insect is correct he ought not to have much difficulty in remedying the damage, providing the habits are similar to those of similar insects in this country. In the orange groves of Florida considerable damage has sometimes been done by our common White Ant (*Termes flavipes*). We find it invariably attacks wood buried in or lying upon the ground and that its central nests are rarely discovered, but generally exist in deeply buried roots or under very large stumps and logs. The workers extend their subterranean galleries for immense distances and it is therefore practically impossible to trace them to a source and thus break up a colony. They damage living trees by eating away the bark about the collar and root, and growing wood is only attacked by them under exceptional circumstances, when there is no dead wood or when they wish to escape from the heated soil. Recently transplanted trees or those planted too deep, or those which have too much earth heaped about the crown or are diseased from any cause, invite attack. Their work is readily distinguished by the fact that the walls of the galleries are always lined with a layer of comminuted wood which gives them a characteristic mottled appearance. Their entrance galleries are under the surface of the ground and under cover of other material, for they never expose themselves to light. The decaying stumps and roots of forest trees on newly cleared land form a source of supply and should be carefully and thoroughly removed from vineyards or fruit orchards. Mulches of decaying wood should not be heaped about the base of the tree. Wherever White Ant attack is suspected the earth should be removed from the affected parts and the ground should be exposed to the depth of several inches, and the dead wood and bark should be cut off with a knife. A liberal application of hot water will destroy those which can not be reached with the knife. Pyrethrum and kerosene emulsion in extremely diluted solution can be applied with success, but the latter should be used with great caution. Trees which have been girdled may be saved by inserting scions between the root below and the stock above, re-establishing the connection between the two. A poultice of mud and cow dung applied to the affected part will protect it and assist in the formation of new bark.—[April 15, 1889, to Mr. Chas. O. Montrose, 222 Russell street, Melbourne, Australia.]

The Toad vs. Cockroaches.

I have read your publication on "Insect Life" with much interest. The article in No. 3, page 67, on "Injury done by Roaches," etc., suggested to me to call your attention to a sentence in my book on "Quince Culture," page 133, where I say: "Poultry are supposed to omit from their bill of fare some of our insect friends, and it is probable the birds do likewise; but all insects are devoured by the toad, which will clear your room of cockroaches over night, just as he will your garden of the vilest of your insect foes." Now is the breeding season for the toads, and they can easily be found in abundance in almost every little pond or puddle of water. The tree toad that tells of coming rain all through the summer by his song is able to climb with the agility of the fly, having a foot of similar construction, and is also a most valuable insect destroyer.—[W. W. Meech, Vineland, N. J., April 9, 1889.

White Grub Injury to Strawberries.

* * * I will mail the white grubs with this. I do not know the scientific name of the insect—we only know them as the white grub. I would like to know if there is any better method of exterminating them than digging them up. My brother pur-

poses using a solution of Paris green and dipping the roots into it when we next set our strawberrry plants. Would it injure the plants? Would it in any way affect the fruit next season? Can you suggest any other preparation which would be as effective in destroying the grubs, but not so dangerous to handle? We have several acres of strawberry plants under cultivation, and of some 20,000 plants set last May it is safe to say the grubs have destroyed 6,000 of them, which we have had to replace. As to the ground under cultivation, it is a mellow clay loam; has been in strawberry vines about seven years, plowed last autumn and rest last May. In the time mentioned the patch has been fertilized with about 125 cords of barn-yard manure, a little over 5 acres, 3 in vines, the rest in grass. Here I will say that in hauling manure in August I have noticed hundreds, perhaps thousands of young white grubs in it, which leads me to believe the beetle is more apt to lay her eggs in a manure heap than elsewhere. In working among our vines in June and July, I have frequently found the eggs of some insect which I suppose to be the May beetle; they are perhaps one-fourth the size of a small pea, perfectly round, break very easily, and contain a whitish fluid. I remember of finding thirteen in one place. * * * The grub seems to feed on the roots of the plant as long as there is life in it. I do not know whether they go from plant to plant under ground or come to the surface nights. I suppose the former, as I never see any at the surface during the day unless dug up. Nor do I know whether toads hunt them below the surface, though I frequently find toads buried in the ground around the plants. Yesterday I placed a full-grown grub about 3 inches from a toad's nose; when he (the toad) made a move the grub disappeared as quick as a flash of lightning. We have previous to this year cultivated only on the matted row system, and although the grubs destroyed many plants it was not so noticeable as now that we cultivate in hills only. Generally it is only young plants they destroy. After a plant has matured it is seldom they destroy it; although continually gnawing at the plant, it throws out roots faster than *one* grub can eat them. Generally there is but *one* grub under a plant, though not infrequently I find two and three; even four are sometimes found working at one plant. But this is the exception and not the rule, except with young ones, when I frequently find six or eight eight in one place.—[L. E. Fogg, South Thomaston, Me., August 9, 1886.

REPLY.—* * * The larvæ which you sent were undoubtedly "White Grubs" and probably the immature forms of the adult beetle which you also sent, and which is, as you suppose, the common May beetle (*Lachnosterna fusca*). I must ask you again whether you are very sure that these grubs are eating the roots of your strawberries. If this is so I fear that you can do no better than to dig them up by hand. Your brother's proposition as to the use of a Paris green solution is not a practical one and will be of no avail. The eggs which you describe are too large to be those of the May beetle and are probably those of snails or slugs, and it is probable that the grub in manure is a different thing. The adult beetles, as you are doubtless aware, are readily attracted to light, and during the season of their flight (May and June) the use of lanterns suspended over pans of water with a scum of kerosene on top will doubtless destroy many beetles which otherwise would lay eggs in the ground among your strawberries.—[August 18, 1886.]

Larva of Cicada septendecim.

* * * To-day I have the pleasure of mailing to you a tin canister containing a Cicada larva *in situ*, and hope it will reach you intact. I almost despaired of finding one *at home*, and my pleasure is great at having succeeded. I examined the lump of soil carefully after finding the larva within and there was positively no hole to be seen that led to the gallery in which the larva was found, which shows that it does not travel about in search of food. You will see that the gallery is very short and just large enough for the larva to turn about in. You will see a hole in the dirt at one end of the gallery, but that I accidentally exposed when scraping the lump smaller to make it lighter and less bulky to mail. I think the best way to get the

ball out of the canister will be to hook something under the string that is around it and gently draw it out. * * * I am sorry that Professor Riley is not in Washington. However, you may be able to keep the piece of soil intact until he comes back. I scarcely expect you will be able to keep the larva alive, but that will not matter so much. One fact is ascertained, that the larva does not require roots to feed upon, neither does it travel about in search of food. I suppose it makes its way slowly and laboriously through the soil, and finds sufficient food in the fresh soil that it slowly brings itself in contact with. One strange thing is that it does not seem to make any difference how dry the soil is.—[J. G. Barlow, Cadet, Mo., August 20, 1886.

SECOND LETTER.—My civilized or tamed Cicada larva is still alive and growing, though I have had him in a small jar between three and four months, with nothing for him to subsist on except what he finds in fine, rather damp soil. What rather surprises me is that I always find him on the top of the soil, notwithstanding I *cover* him with fresh fine earth at intervals, in the hope that he will remain below the surface and act in a more *natural* manner. Though I have buried him in the new soil frequently, I always, next time I visit him, find him *pawing* around on the top.—[J. G. Barlow, Cadet, Mo., October 14, 1886.

REPLY.—* * * I am interested in the account of your tame Cicada larva. Does it not strike you that it comes to the surface on account of a lack of food ?—[October 18, 1886.]

Some Additions to Packard's Forest-tree Insects.

I have been comparing my note-book with Packard's Bulletin No. 7, and have noticed several omissions in the lists therein which may be of some interest.

HICKORY.—*Saperda lateralis:* A large number of specimens on a windfall, in copulation. Philadelphia, June, 1882.

ELM.—*Saperda candida:* One pair in copulation on young elm. Concord, June 7, 1883. *Anthaxia viridicornis:* Eating leaves of elm. June 16, 1885. Several specimens.

PINE.—*Neoclytus erythrocephalus:* Two specimens. June 24, 1885. *N. muricatulus:* Common on cord-wood and standing timber. June 24, 1885.

OAK.—*Agrilus bilineatus:* Over one hundred specimens taken on a white oak. June 15, 1885.

Buprestis ultramarina is taken on pitch-pine at Gloucester, N. J., from April 20 to May 5. The Philadelphia collectors always look for it between those dates.

Goes tigrinus is commonly taken on the oak in Philadelphia, and not on the hickory as stated by Dr. Fitch and quoted by Packard.

I do not find these occurrences noted in Harris or Packard and so take the liberty of communicating them.—[Adams Tolman, Concord, Mass., June 25, 1885.

A Phytoptus on Plum.

I send you some shoots from a plum tree with a fungoid growth in the shape of small pustules at the base of the small branches and under the buds, and standing very thick in rings around the branch. They can also be traced with the glass all along the main branch, protruding from cracks of the outer bark. The tree is healthy and every branch and twig is loaded with the fungus, as I suppose it to be. * * *—[A. J. Caywood, Marlborough, N. Y., January 28, 1888, to Professor Scribner, Department of Agriculture.

REPLY.—Mr. Scribner has referred to this Division your letter of the 28th ult., accompanied by specimens of what you take to be a fungoid growth on small shoots of plum. On breaking open the small pustules, as you have noticed, they are found to be full of small mites of the genus *Phytoptus.* The pustules are evidently nothing but the galls of the mites. I do not recognize the mite, and am not aware that any species having this exact habit has been described. A close study will be necessary

to ascertain the exact life-history of this species and the best time at which to fight it. You can doubtless rid your trees at this time of the year by severe pruning, but the probabilities are that in the spring there will occur a time when the mites wander from their old galls to the new growth in order to form new galls. If this time can be ascertained, which can be done only upon the spot, it will be comparatively easy to destroy these creatures by spraying the trees with a dilute kerosene emulsion. I trust that you will follow this matter up and not fail to let me know the results and to send me specimens from time to time. I have every reason to believe that the galls are the winter form produced by *Phytoptus pruni-crumeni*, which produces in spring the little purse-like galls on the leaf.—[February 1, 1888.]

SECOND LETTER.—You think the galls on the plum tree may be a winter form of growth; the trees were infested the same during the summer and the summer previous. I never could make myself believe that knots on plums and cherries were of fungoid origin, as I always supposed they were caused by insects, as knots in the forest and other vegetable life are recognized to be, but scientists say fungi, and of course I was compelled to say so too. I now send you another package containing the regular black knot and the galls sent you last week so inseparably connected with them that I think you will say they precede the black knot, and I am inclined to believe that they are the first appearance of the same. You will notice at the base of some short spurs the pustules show the black and pinhead like sections of the fully matured black knot, and by looking the specimens all over you will find a growing similarity from the smooth fresh gall to the matured gall sections of the hard black knot; and it would seem that the development of the younger galls was arrested by the close of the growing season. I shall not be surprised if the branches that are covered with these galls will another season be a perfect scab of the common plum knot.—[A. J. Caywood, Marlborough, N. Y., February 6, 1888.

SECOND REPLY.—Yours of the 6th inst. with additional specimens came duly to hand. The twigs are interesting and the abundance of the mite galls is surprising. Their occurrence with the black knot is probably a simple coincidence as there is no possibility that they can have any connection with the black-knot disease, which, as is well known, is caused by a fungus (*Plowrightia morbosa*). It is barely possible that the attacks of the mites by weakening the vitality of the twigs render them more liable to the attacks of the fungus; but beyond this no possible connection can be plausibly traced.—[February 8, 1888.]

A Lac Insect on the Creosote Bush.

* * * I also mail you a small package containing stems with exudations of the creosote bush (*Larrea mexicana*) of which Dr. Loew says, "the reddish-brown exudation on the branches will yield a red coloring matter showing all the reactions of cochineal. The alcoholic extract of the leaves on evaporation yields a greenish-brown residue of a specific and somewhat disagreeable odor, more strongly perceptible on boiling the extract with water. This residue is only to a small extent soluble in water, and the solution has an acid reaction. It yields a light yellow precipitate with acetate of lead. The part of the alcoholic extract that is insoluble in water is easily soluable in alkalies. It also dissolves in nitric acid at a moderate heat, whereby oxidation takes place. On addition of water, a yellow, brittle mass is precipitated."

The Mexicans use an effusion of the leaves for bathing in, in rheumatic affections, and as long as the disease is in its first stages, with remarkably good results.

But apart from its medicinal properties, I am led to believe that these exudations, if properly examined, would give a splendid bright red coloring matter and a very superior varnish resembling the celebrated Japan lacquer. Do not you think it worth while to have the necessary chemical analysis made? There are miles upon miles of the bush growing here and far down into Mexico, and I should think that a man could gather from 60 to 100 pounds of clear exudation matter in a working day of ten hours. My supposition as to the qualification of producing a superior varnish is

based upon the experiments (incomplete though they were) of a French chemist who passed here about a year ago and who died since in South America.—[John A. Spring, Tucson, Arizona, August 21, 1887.

REPLY.—The portion of your letter of August 21, referring to the exudation of the Creosote Bush (*Larrea mexicana*) has been referred to the Entomologist, who reports that the specimens were received in good condition and that they form welcome additions to the collections of the Entomological Division. Strange as it may seem, it has been abundantly proven that this exudation is that of an insect and not directly of the plant. The insect in question is the *Carteria larreæ* of Comstock, described in the Annual Report of this Department for 1881–'82, page 211. This insect belongs to the Bark-lice or Coccidæ, and to a peculiar group of these insects which secrete wax and lac in different forms. It is closely related to the insect which produces the stick lac of commerce and which is known as *Carteria lacca* Kerr. Another species has been described by Professor Comstock, which appears upon Mimosa, in Mexico. This he calls *Carteria mexicana*. You will find a good discussion of the characters of these insects in the Annual Report of this Department just mentioned, and of the insect theory as opposed to the plant theory, including also some remarks upon the chemical properties of lac in the American Naturalist, Vol. XIV, p. 782 (November, 1880). You will also find the chemical properties of the stick lac of commerce treated in most of the chemical dictionaries or encyclopædias.—[August 31, 1887.]

A Rhizococcus on Grass in Dakota.

Inclosed please find two spears of grass with some eggs of something that I wish you to determine for me if you can, as the grass is infested with it all over this country. If you don't experiment with such things please hand it to some one who does. If they do not hatch until spring, a warm place and a little sprinkling would bring them to life. If they are injurious to stock let me know, as there are lots of horses and cattle running out here.—[A. E. Hall, Buffalo Gap, Custer County, Dak., February, 1888.

REPLY.—Your letter of recent date inclosing spears of grass with eggs laid in white sacs has been received and referred to the Entomologist, who reports that the white waxy sac is excreted by a bark-louse which seems to be a new species of the genus Rhizococcus. Up to the time of depositing the eggs the wingless degraded females of this insect are naked, but as the time for oviposition approaches they begin to secrete this smooth white sac all over the surface of the body, and as the secretion becomes thick they begin depositing their eggs, moving forward in the sac thus formed and after death shriveling up and remaining in the anterior portion. It will probably not have the slightest deleterious effect upon the stock.—[February 18, 1888.]

Wash for Apple-tree Bark-lice and Borers.

I find the most effectual wash for bark-lice on apple and pear trees and borers in apple and peach trees to be the following recipe: 5 pounds of potash (Babbitts's the best) and 5 pounds of lard dissolved in 5 gallons of boiling water; 1 peck good stone lime slacked in 5 gallons boiling water, while hot mixed with potash and lard. The above mixture can be kept in an old tub or barrel for any length of time. To use add to each gallon 2 gallons of boiling water, and while hot apply to trunk and large limbs with an old broom. If this mixture is applied to trees while young and used year after year, the bark of the trees will be kept as smooth as glass and all bark-lice and borers destroyed.—[J. Luther Bowers, Herndon, Va., February 24, 1888.

Saw-fly on Polygonum dumetorum.

To-day I mail a box containing some larvæ that may interest you. This is the first colony I have seen of them. They were found on wild grape vine, also on another climber, *Polygonum dumetorum*, which I enclose, and have the peculiarity of curling

themselves into a compact ring, on the *under* sides of the leaves, when not feeding. When undisturbed they are covered with a pretty close coat of very white down; some, as you will see, are without the down. They look like bird-droppings. The locality is a very shady woody ravine where the sunshine can not penetrate. In the box there is a small larva, found on a plant not common, in the same place.—[J. G. Barlow, Cadet, Mo., September 10, 1888.

REPLY.—* * * The species is *Emphytus testaceus,* being nearly allied to the Strawberry Saw-fly. The climbing plant which you enclose is *Polygonum dumetorum.* —[September 14, 1888.]

Oscinis sp. on Chrysanthemum.

Some one sends me a specimen of *Chrysanthemum frutescens,* with an insect pest that seems new to me. * * * —[Thomas Meehan, Germantown, Philadelphia, Pa., January 12, 1887.

REPLY.— * * * The insect infesting Chrysanthemum is a Dipterous leaf-miner of the genus Oscinis and is probably an undescribed species. I have received the same thing within a few days from Mr. Charles Henderson. Certain of the flies had issued on the way, so that it is now too late to do much in the way of hand-picking, which is the only available remedy. When another brood appears the infested leaves should be picked off and burned. In this way the pest can be very readily held in check.—[January 14, 1887.]

Ants destroying young Maples in Nebraska.

There is a small black ant that is destroying all of the young rock or sugar maple trees which have been grown from seed planted this summer in the western part of Nebraska. The seeds were planted on new land, opened last spring. I will give you a description of how the ants attack the young trees and how the trees are affected. They attack the trees just above the ground. The trees look as if they were stung. The bark turns brown as if it was decaying. There is a ring formed around the tree about one-eighth inch wide, and the young tree dies when the ring is completed. * * —[B. F. Blythe, Diller, Jefferson County, Nebr., July 16, 1886.

REPLY—* * * We should like very much to receive specimens both of the ant and its work on the young sugar maples. The efficacy of any remedy which you may try depends altogether upon the trouble and expense to which you are willing to go. The best preventive will of course be a broad band of bright tin fastened securely around the base of the tree. Search should be made for the colonies, which you can destroy by the use of bisulphide of carbon, which is poured in small quantities into the nest. Naphthaline in the form of a crystalline powder stirred in and about the hills is very effective in breaking up colonies. When they have begun to attack a tree it is with extreme difficulty that they can be permanently driven off.

Pyrethrum dusted upon the tree and scattered about its base kills all the ants with which it comes in contact and affords a temporary relief, but its effects are not lasting. Coating with shellac and binding the trunk with a band of tar cannot be relied upon to keep them off permanently. A broad band of rabbit fur, tied around the trunk with the hair downwards, is effectual in preventing their ascent. A still more simple and almost as effective one is a barrier of chalk. This is applied by rubbing a lump of raw chalk over the bark around the tree to make a band about 8 inches wide, and completely encircling the trunk. In attempting to cross such a band the ants nearly always slip and fall to the earth. This device is not permanent, and requires frequent renewal on account of the effect of dews at night and of rains. Very often soft clay, Fuller's earth, or talc may be substituted for the chalk, but in all cases must be applied by rubbing on from a dry lump. Good results cannot be obtained by using any of these substances in powder, dried, or as a whitewash applied with a brush.—[July 22, 1886.]

GENERAL NOTES.

THE SPIDER-BITE QUESTION.

The following item appeared in the *Evening Star* (Washington) for March 12, 1889, and is a fair sample of the newspaper reports in reference to spider-bites which are so common:

BITTEN BY A BLACK SPIDER.

Mr. Tileston F. Chambers, son of Mr. D. A. Chambers, of this city, came home from Princeton with several fellow-students to spend the inauguration holidays. On Saturday, March 2, he was bitten twice on the arm by what the doctor said must have been a black spider, with the most alarming results. Blood-poisoning and jaundice followed, but by careful treatment he is now rapidly recovering. The physician said that another bite would undoubtedly have proved fatal.

Learning by correspondence from Mr. D. A. Chambers that the physician in charge was Dr. Z. T. Sowers, of Washington, a well-known and prominent practitioner, we called upon Dr. Sowers, who informed us that he knew little more than was given in the newspaper statement. He said that he had had several such cases in his practice and that he was accustomed to attribute these bites to black spiders, for the reason that he knew of no other insect found in such localities which could produce the effect. The room in which young Mr. Chambers was bitten was one which had long been disused, and he occupied it on the night of March 2, for the reason that the rest of the house was full of inauguration visitors. Thus there is nothing special connected with this instance.

Professor Riley is under the impression that certain of these cases result from the bite of the Blood-sucking Cone-nose (*Conorrhinus sanguisuga*), an insect which is occasionally found in houses, and which is able to inflict a very severe wound with its beak.

Evidence in regard to fatal bites is very weak, with the exception of the genus Latrodectus, and this genus is never found in outhouses or disused rooms. Dr. Elliott Coues calls our attention to the fact that if the Latrodectus stories are true we have a case in this creature of the most powerful poison known. With the most poisonous snakes an appreciable quantity of poison, say one or two drops, is injected into the wound, but with the Latrodectus an infinitely smaller quantity seems to produce as strong an effect.

In this connection we may quote an item which falls under our notice in the April number of *Psyche*, and for the reliability of which the *Scientific American* (November 17, 1888, vol. LIX, p. 310) is responsible:

SPIDER POISONS.

Professor Breeger has recently investigated the poisons of spiders. He found that the Russian varieties of spider, *Phalanchium* and *Trochosa* (tarantula), are non-poisonous, but that a third, *Caracurt*, or "black wolf," secretes a powerful poison, forming

25 per cent of its whole weight. This substance is a peculiar unstable alkaloid, destroyed at 60° C., or by alcohol. Introduced into the circulation of warm-blooded animals, one-thirtieth of a milligram per kilogram of the animal treated was sufficient to cause death. It exceeds in power all known vegetable principles and prussic acid, being comparable in toxicity with the poison of snakes.

The following two letters also bearing on the subject are appended, the first of which is from Mr. R. Allan Wight, of New Zealand:

What Dr. Wright told you about the Katipo is perfectly correct. I was then living close by and knew all the parties and all the circumstances, and my sons also remember it all. It was as clear a case of Katipo poisoning as possible, and the man said he saw the spider bite him and minutely described the spider, which description tallied exactly with its proper one. A case occurred at Whangarei a few weeks ago, where a man was bitten and suffered a good deal, and I have written to the medical man who attended him and will let you know the result. I am also going soon on another long tour in the north, where I shall be able to get many tales and reliable information from both natives and white men as to the Katipo, and will let you know when I come back. I drove over to a man who is said to have lost his arm "*through a Katipo*," but I found that he does not know one when he sees it, did not see the bite inflicted, was in a place where the Katipo does not live, and when the arm was removed *the bone was diseased* ("honeycombed"). That is one of those tales people hear and which make it difficult to believe anything. I feel certain the Katipo is a very dangerously poisonous spider, but I never but once saw a case with my own eyes. It was many years ago and I was out with a war party of Maoris; one night we found ourselves in an unpleasant position as far as they were concerned. On our rear there were a number of nice hollow places to sleep in, but as these were *Maori ovens*, in which men had been cooked for a cannibal feast, the natives not only would not sleep in them but they would not let me; so we lay down on the bare shingle beach with no tent in a high wind, and before us at a short distance was an island that is (they say) inhabited by evil spirits; so with spirits both before and behind we lay awake talking in subdued whispers.

I had my head on a rush bush, but they would have me shift it on to a rock, because they said the Katipo lived in the rushes by the sea-side. I was anxious for them to sleep, knowing that to-morrow we would want all our strength, but it was no use, for by and by a man screamed out that the Katipo had bitten him, and in a moment lights were brought, and sure enough the Katipo was there within a foot of the wound under his mat. The arm swelled, but not so much as to give alarm. What alarmed me more were his weakness and languor and the lowness of his pulse and his heart action. The poison certainly was a powerful *narcotic*, if symptoms go for anything. I gave him all the brandy we had, and the natives pretty well burned his wound and rubbed and rubbed at him till they got him into a perspiration, but he did not properly recover for several days, and if one had only known it would have been a mercy to have let him die (which I believe he would); so I thought when I saw him gasping his life away with blood and froth flowing from his mouth. Ugh! That is one of the several scenes I do not care to think about. By the by, I could not get the specimen; the Maoris burned it, as they said the Katipo is an *evil spirit and if we did not burn it the man would die*. I never heard of any Katipo but one; I think Taylor is mistaken. I have many chiefs here, and I asked them only to-day, but no one ever heard of but one Katipo—the black spider with a vermilion spot on the abdomen. * * * .—[R. Allan Wight.

Immediately after reading Dr. Corson's interesting article on Spider Bites in the March number of INSECT LIFE I went into a partially darkened room and drew on my bare feet a pair of felt boots that had been unused for some time. Simultaneously I received a sharp puncture on my ankle.

Dr. Corson's case of the man who was bitten on the toe while putting on his stock-

ing was at once brought vividly to mind; and all the circumstances favored the idea that I had been bitten by a spider.

From the reported cases it seemed that a painful experience was before me, if nothing worse; but I could not help feeling a certain exultation because the elusive creature had at last bitten the wrong man, and would soon be brought to the bar of justice and his photograph placed in an entomological rogues' gallery.

I took off my boot and, holding it carefully, lighted a lamp; and with infinite pains, lest some guilty thing should escape, I soon succeeded in dislodging a fine wasp!

Actuated by a strong sense of duty, nine out of every ten men will go out of their way to kill a snake of whatever species. Probably as many believe that spiders are capable of inflicting poisonous bites. Wasps are as common as spiders at some seasons of the year about out-buildings. Lacking more positive evidence, it seems probable to me that the sting of a wasp and the imagination of the patient are sufficient to account for many so-called spider-bite cases.—[G. M. Dodge, Louisiana, Mo., April 20, 1889.

UROPODA AMERICANA ON EUPHORIA INDA.

Mr. J. V. Dansby, of Pensacola, Fla., sends us a specimen of *Euphoria inda*, unearthed in the working of a hot-bed. It was covered with small parasites which proved to be *Uropoda americana*. This mite commonly infests many beetles, but we believe has not previously been recorded as infesting this particular species.

EVAPORATED SULPHUR FOR RED SPIDER IN GREENHOUSES.

Some interesting experiments have been carried on at Amherst by S. T. Maynard, the horticulturist of the Massachusetts Agricultural Experiment Station, which indicate that evaporated sulphur is not only a good fungicide, but that it is an excellent remedy against *Tetranychus telarius*—the common Red Spider. The remedy consists in heating a kettle of sulphur for three or four hours twice or three times a week to nearly boiling point in the room with infested plants, care being taken not to heat it so that it will take fire, but evaporating enough to fill the room with visible vapor and to make the sulphur odor perceptible. So perfect a remedy is this claimed to be that infested plants exposed for a few hours in the room where sulphur is used are said to be completely freed.

DOUBLE FLOWERS CAUSED BY MITES.

A large number of experiments have been carried out at Innsbruck by Professor Peyritsch, tending to show that double flowers may be artificially produced by the agency of a mite (Phytoptus). It seems that the professor was examining a wild double flower of *Valeriana tripteris*, and discovered that it was infested with the mites in question. He transferred these mites to other plants, chiefly of the orders *Valerianaceæ* and *Cruciferæ*, and a few *Scrophularineæ*, *Commelynaceæ*, and even others, but the best results were obtained in the first named. Various kinds of doubling were produced, such as petalody of the stamens and pistil, prolification and duplication of the corolla, etc., as well as torsions and fasciations of the shoot. The leaves were also affected,

the margin showing teeth like those of a comb. By infecting the plant at different times either the leaves or the flowers may be influenced, and it appears that the parasite must attack the organ in its earliest stages. Professor Peyritsch thinks that there are certain mites which produce double flowers in certain plants, as the mites in which he was particularly interested were always most abundant in certain species and less so in others. The experiments are recorded in the *Transactions of the Imperial Academy of Vienna*, Vol. XCVII, I, p. 597.

"The plants of *Valerianaceæ* experimented upon include *Valeriana* (twelve sp.), *Valerianella* (three sp.), *Fedia*, *Centranthus* (three sp.), *Patrinea.* Abnormal leaves were induced in ten species of *Valeriana*, all of the *Valerianellas*, two of *Centranthus*, and in *Fedia.* Double flowers were produced in *Valeriana* in six cases, three times in *Centranthus*, and once each in *Fedia* and *Valerianella.* Among the Crucifers Professor Peyritsch worked on *Biscutella*, *Brassica nigra*, *Capsella bursa-pastoris*, *Cochlearia officinalis*, *Eruca*, *Lepidium*, *Malcolmia* (two sp.), and *Sisymbrium sophia.* Various were the results; in many of the cases (*Cochlearia*, *Eruca*, *Lepidium*, *Sisymbrium*, *Brassica*, *Capsella*) bracts were formed resembling the leaves, but of smaller size; proliferous flowers were formed in *Brassica* and *Biscutella;* petalody of stamens occurred in *Cochlearia* and *Eruca.* In *Linaria cymbalaria* peloriate flowers and other changes were found.

"Professor Peyritsch says that the results are effective or not according as the plant is a good host-plant for the mite—a good host-plant being quite crippled.

"Among the Valerians, those plants with their leaves were more easily affected than others with more substance.

"The *Phytoptus* infesting the buds of the Hazel, Corylus, and which causes malformations in it, was transferred to plants of *Brassica*, *Sisymbrium*, *Capsella*, and *Myagrum.* Bracts were, in consequence, developed in *Sisymbrium*, *Capsella*, and *Myagrum*, in which, as in most Crucifers, the bracts are generally wanting; and in the last-named double flowers.

"*Bellis perennis* gave the same results when infected by the mites from *Valeriana*, *Campanula*, or *Corylus*, viz, the production of very hairy leaves, but not toothed, the disc florets green, and the involucral bracts elongated.

"It was observed that after infection growth in length was slow, but lateral bud development was accelerated unless other abnormalities appeared."—[*Udo Dammer, Berlin.—Gardeners' Chronicle*, March 16, 1889, Vol. V, p. 333.

RHEUMATISM AND THE STINGS OF BEES.

"A very nice supply of bee literature is furnished from week to week in the *British Bee Journal.* Amongst other wonderful discoveries of the present day it appears to have been reserved for Dr. Tere to have

discovered a cure for rheumatism in the sting of a bee. Those who have hands which refuse to catch hold of a thing properly through that painful disease, listen. He says he has tried his remedy upon 173 patients and been uniformly successful. As we have no means of contradicting him, his word must be accepted till we can disprove it. Hear ye, therefore, the words of the learned doctor. Herr Tere says, to the above 173 patients he applied 39,000 stings. The number seems to us rather appalling, but the doctor endeavors to inspire courage by saying that after the first sting the pain is felt less and less, till at last it is gone. When the pain of the sting is gone the rheumatism departs with it. Though I have had no experience of rheumatism, and therefore no need of cure, I can vouch for the pain getting less and less, after each sting, in my own case. Before dismissing the subject we might say that we have frequently heard cottagers, who have had rheumatism, and been stung accidentally, say that as the pain of the sting subsided, so did the rheumatism follow suit."—[*W. Chitty.—Gardeners' Chronicle*, March 30, 1889, Vol. V, p. 404.

THE BLACKBIRD AND THE BOLL WORM.

We learn from the April number of the *American Garden* that Secretary Bonham, of Ohio, on learning, a few years ago, that the Blackbirds were destroying the green-corn ears, and that his neighbors were all shooting the birds, investigated the matter, and found that wherever the Blackbirds had been at the corn they had extracted a Boll Worm. He thereupon told his hired man that the neighbors could drive all the Blackbirds over into his corn-field if they wanted to! This is an interesting experience, but was the evidence sufficient, the observations detailed enough, or the possibilities of error sufficiently guarded against to make it thoroughly reliable?

SWARMS OF A GNAT IN IOWA.

We learn from the *Daily Gate City*, of Keokuk, Iowa, March 28, 1889, that immense swarms of the little gnat known as *Chironomus nigricans* appeared in that vicinity within the few days previous, coming from the Mississippi and forming in the air in immense clouds, covering everything with which they come in contact.

NEW REMEDY FOR STRIPED BUGS.

Vick's Magazine states that a little calomel mixed with flour or ashes sprinkled on cucumber or squash vines will keep them comparatively free from this insect.

THE EUROPEAN RIBBON-FOOTED CORN-FLY.

We notice in the *Rural New Yorker* of April 13, under the head of "A New Insect Pest," an account of the damage done Barley and Rye by *Chlorops tæniopus*—the common Ribbon-footed Corn-fly of Europe—

in Sweden. It seems that on the island of Gothland Barley to the value of nearly half a million dollars was destroyed by this larva, while the same insect destroyed fully a third of the Rye crop of the province of Upland. We call attention to this as an item of news, but there is no reason for calling this a *new* insect pest. It has been known in Europe for many years, and was treated at considerable length by John Curtis in his well-known work on "Farm Insects," published in Glasgow in 1860, and had for many years prior to that date damaged Rye, Barley, and Wheat in England and on the continent.

SPARROW DESTRUCTION IN AUSTRALIA.

"Miss Eleanor A. Ormerod, consulting entomologist to the Royal Agricultural Society of England, has forwarded a donation of £5 to be applied to the destruction of Sparrows in South Australia. A subcommittee of the Royal Agricultural Society of South Australia has undertaken to raise subscriptions in aid of this worthy object, and it is proposed to have monthly competitions in the production of Sparrows' heads and Sparrows' eggs. These competitions will take place after the next autumn show in Adelaide. At the autumn show there will be a grand prize competition, when prizes of £2, £1.10*s.*, 10*s.*, and 5*s.* will be offered for the largest numbers of Sparrows' heads, and the same value in prize-money will also be offered for the largest numbers of Sparrows' eggs. Additionally to this, every competitor who fails to secure a prize, and yet brings in 100 or more heads or eggs, will receive a bonus of 2*s.* 6*d.*, and any one producing under 100 and not less than 50 heads or eggs will receive a bonus of 1*s.* These prizes and bonuses ought to encourage the boys to exert themselves.

"An American paper tells us that: 'There is a scarcity of our native song birds; the Sparrow drives them away and destroys their eggs and young. Dr. Merriam estimates that a pair of Sparrows in ten years will increase to 275,716,983,698. They migrate over the country in grain cars, in which they have been caged while stealing breakfast. They can be destroyed by throwing down a handful of wheat and shooting among them with fine shot. The owl and hawk are very helpful and should invariably be spared.'

"In Victoria the fruit-growers are becoming alarmed at the depredations of the Sparrows, which are exceedingly numerous. A bill was lately placed before the legislature there, to provide means for relieving cultivators from this pest, but, as in South Australia, it was opposed by those who were not subject to losses, who were too indolent to examine into the truth of the complaints made, or who were too selfish to interfere in a matter in which they were not directly and personally concerned. A few of the opponents were led away by statements that the Sparrow does little harm in its native home in England, but it is a fact that it does a great deal of damage, though it is there kept from increasing so rapidly as in Australia—first, by the colder weather,

which limits the breeding season to a month or two, whereas in Australia the season lasts very nearly all the year through; and secondly, in England there are many owls, hawks, and other enemies which prey upon the Sparrows, whilst in Australia these enemies are almost entirely absent. Perhaps, when it is too late, the opponents to the Sparrow bill will find that their pockets and personal comforts are very intimately affected by the presence of hordes of these little pests, which drive away all the insectivorous birds, but will not touch an insect (except from pugnaciousness), but which will eat all the seeds of all the plants that grow in the fields, spoil all the fruit that is produced in the orchards and vineyards, and even attack the vegetables and flowers in the gardens when there is nothing else to destroy."—*Garden and Field* [Adelaide, South Australia], January, 1889, vol. 14, p. 92.

HERMETIA MUCENS INFESTING BEE-HIVES.

In August, 1887, Dr. W. B. Rohmer, of Grand Bay, Mobile County, Ala., wrote us concerning an insect that had caused much trouble to bee-keepers in his vicinity, accompanying his communication with specimens of the imago and also of the eggs which he had observed the insect in the act of depositing. Noticing the insects alighting in the vicinity of his hives, his attention had been drawn to them, and he found that they introduced their ovipositors beneath the entrance blocks or in the cracks between the hives and the bottom boards and remained in this position several minutes, perfectly motionless, repeating the operation a number of times. Upon investigation a large number of eggs were always found deposited. When the hives were removed for the purpose of cleaning them, worms in all stages of growth were found upon the floors, especially in recently transferred hives, where there had been a large accumulation of *débris* incident to cleaning away and sealing comb to the frames. In this *débris* of wax and foreign material all sizes occurred, from the tiny worm just hatched to the large one snugly ensconced in its web. Where the hives were clean and there was nothing in the bottom for the worms to subsist upon, the newly-hatched larvæ made their way up unobserved to the combs at the bottom of the frames, eating and growing as they advanced. The perfect insects were also seen laying their eggs in the cracks in the sides of old hives where the boards were nailed together, and for the reason that they have so many points of introduction these hives are more infested.

The specimens sent proved to be a true Dipteron, *Hermetia mucens*, which belongs to the Stratiomyidæ. Nothing similar to these habits has ever been published, so far as we are aware. In fact most of the species of this family, except some which are aquatic in their early stages, live underground and their life history is not thoroughly understood. This, therefore, is a matter of not only considerable scientific interest, but also much economic importance from the stand-point of the bee-keeper. That the Hermetia occurred in such locations and laid the

eggs mentioned there can be no doubt; but that Dr. Kohmer has confused the larvæ of Galleria or some other Guest-moth with the larvæ of the fly seems probable.

THE CHINCH BUG THIS YEAR.

A report comes to us from Mr. J. W. Beach, of Batavia, Boone County, Ark., to the effect that a general alarm prevails in that section of the country for many miles around in regard to the Chinch Bug. They did a considerable amount of damage there last year, and those that wintered over have already destroyed many fields of grain this spring. The wooded country in places is reported full of them, so much so that the people are contemplating setting fire to their woodlands.

CODLING MOTH DESTRUCTION IN TASMANIA.

We have in past years referred to the energetic way in which the authorities in Tasmania were dealing with the Codling Moth problem, and as an evidence of their continued work we quote the following from the Hobart Town *Mercury* of recent date:

> The inspector submitted a list of persons who had failed to send in schedules, and a resolution was passed to issue summonses to all in default. It was also resolved that the inspector proceed against all persons neglecting to gather and destroy infected fruit and also for neglecting to bandage their trees.

GAS LIME FOR THE ONION MAGGOT.

A correspondent of the *Gardener's Chronicle*, as reported in the issue of April 6, 1889, states that having had his cauliflowers, onions, brocolis, savoys, and cabbages destroyed by wholesale, had his garden trenched in the autumn and winter and gave it a thorough dressing of gas lime and salt and continued to use a slight dressing every season afterwards. The crops are no longer molested either by the Onion Maggot or by the Wire-worms. He states that salt should be omitted from the dressing if the land be heavy.

PARIS GREEN FOR THE GARDEN WEB-WORM.

In our annual report for 1885 in treating of this insect we urged as the most satisfactory remedy the use of one of the arsenical mixtures, and are glad to learn that experiments made in 1888 by Professor Cassidy, of the Colorado State Experiment Station, proved very effective. Professor Cassidy states that he made his first application of Paris green June 1, using 1 pound of the poison to 100 gallons of water, which proved to be very effective and not dangerous to the plant. A second application was made June 20 and another July 3.

PHYLLOXERA IN ASIA MINOR.

We learn through the *Gardener's Chronicle* of April 6 that the last number of the *Kew Bull tin* states that the introduction of Phylloxera

into Asia Minor appears to have been the result of a deliberate importation of the vines from a country where the disease was known to exist.

BARK LICE ON THE COCOA-NUT.

At the meeting of the Royal Horticultural Society, March 26, Mr. McLachlan exhibited leaves of the Cocoa-nut Palm from Jamaica infested by *Fiorinia pellucida* Sign. and *Mytilaspis buxi* Sign. (*M. pandani* Comstock), the former being the more abundant. Mr. Morris stated that he had seen a plantation of 25,000 trees badly infested and that the first attack was noticed in 1881 after the cyclone of 1880, the planters attributing the unhealthy condition of the trees to breaking of the roots during the cyclone.

IMPORTANT PUBLICATIONS ON ECONOMIC ENTOMOLOGY.

Relazione intorno ai lavori della R. Stazione di Entomologia Agraria di Firenze, per gli anni 1883–'84–'85. Per Ad. Targioni Tozzetti. Annali di Agricoltura, 1888. Firenze, 1888.

Report of Observations of Injurious Insects and Common Farm Pests during the year 1888, with methods of prevention and remedy (12th Report), by Eleanor A. Ormerod. London, 1889.

Report of Entomologist and Botanist, James Fletcher. Reports of the Officers of Experimental Farms for 1888. Ottawa, 1889.

We have received during the last month three of the most important works upon economic entomology which have been published by foreign Governments during the year. Professor Targioni Tozzetti has brought out the second of his extensive reports on the experiments conducted at the laboratory of the station for agricultural entomology at Florence. The first of these reports was published in 1884. The present volume is a large octavo of over 500 pages, illustrated by about 70 text figures, and is devoted mainly to the consideration of the injurious insects of Italy. Some attention is also paid to fungi. The greatest space given to any one insect is devoted to the Grape-vine Phylloxera, although many species of all orders receive treatment.

Miss Ormerod's report for 1888 covers 130 pages and is written with her usual great care and attention to the practical side of her work. The report this year covers a large number of species, and the longest individual article is that upon the new Corn Moth (*Ephestia kuhniella*), concerning which we have published a letter from Miss Ormerod in No 10 of *Insect Life*. Attention is called to certain injuries by Anguillulidæ, and a well-executed full-page plate is given to an Eel-worm attacking oat plants. She publishes another instructive table giving prices of the sales of sound and warbled hides in connection with a supplementary article on the Warble-fly (*Hypoderma bovis*).

Mr. Fletcher's report as entomologist and botanist to the Dominion of Canada possesses more interest to the American reader through the identity of the insects treated with those occurring in the United States.

The principal insects treated are the Wheat Midge, the Army Worm, the Wheat Stem-maggot, the Bean Weevil, the Clover Cut-worm (*Mamestra trifolii*), and Cut-worms in general. We sympathize with Mr. Fletcher concerning the poor quality of paper and press-work used in the Dominion reports which we have seen, and assure him that we consider his reports worthy of much more attractive form.

THE PYRETHRUM INDUSTRY.

We learn from the *California Florist and Garden* for March, 1889, that during the year 1888 there were imported into the United States from Dalmatia and other places between 200 and 300 tons of dry Pyrethrum flowers, while California's product was 52 tons.

A NEW USE FOR THE FLUTED SCALE.

A writer in a recent number of the *Florida Dispatch* suggests that inasmuch as there is a probability of overdoing the orange business in Florida (as it is estimated that that State will in the next five years be able to supply a box of oranges for every man, woman, and child in the United States), a good way to limit the production would be to introduce the Fluted scale (*Icerya purchasi*) into Florida!

CODLING MOTH NOTES.

Mr. D. B. Wier, in the *Orchard and Farm* (California) for March, 1889, in a general article on "Orchard Work," in which he summarizes the remedies for the Codling Moth, suggests that every large orchard should have a store-house or packing-house or building that can be made moth-proof, into which all apples and pears should be taken as soon as gathered. Packages of these fruits should never be left outside of this building over night. He suggests simply the covering of all openings in the building with fine wire gauze and the use of as few windows as convenient. The moths issuing from the fruit will fly to the windows, where they may be destroyed every morning. This suggestion is a good one, as we have shown in our article on the Codling Moth in the Annual Report of this Department for 1887, pages 97 and 98, where we quote the experience of Mr. DeLong, of California, who killed upwards of 15,000 moths in this way.

Prof. E. A. Popenoe gives a detailed account of his experiments in spraying apple trees with arsenical combinations in the first annual report of the Kansas Experiment Station, a review of which is published in the *Industrialist* for April 20, 1889. His experiments seem to have been carefully carried on and comparisons made with unsprayed trees. His best results were obtained with a mixture of 1 ounce of Paris green to 20 gallons of water. By the use of this two-thirds of the crop was saved at the expense of damage amounting to 8⅓ per cent. of the foliage.

OBITUARY.

We have just learned, through Dr. Marx, of the sad death of Count Eugene Keyserling, which occurred at Reichenbach, Silesia, April 4. Count Keyserling's death is an irretrievable loss to the study of American Arachnology. For a number of years he had been engaged in studying the spiders of North America, and had published in the Ver. d. k-k. Zool. Bot. Ges. seven numbers of his "New Spiders from America." He had also published a monograph upon the Laterigrades of America and the Theridiidæ of America. In the last two monographs he used, in addition to his other material, Dr. Marx's extensive collection, and also in the two last numbers of his "New Spiders from America." He was also engaged upon a monograph of the Epeiridæ of North America, but some time before his death interrupted this work to finish the great monograph commenced by Koch on the "Spiders of Australia." At the present writing we are not informed as to whether this work is completed, but if not it seems to be followed by a fatality, for Koch lost his eyesight while engaged upon it. Count Keyserling was quite advanced in years.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

May 2, 1889.—Mr. Ashmead read a paper on some South American *Chalcididæ*. He exhibited a number of interesting genera not found in North America, and gave his reasons for changing the systematic position of several genera. He also showed a remarkable Encyrtid, with six-branched antennae, allied to Tetracnemus.

Mr. Howard read a paper on "The Authorship of the Family *Mymaridæ*." He showed that the authority should be "Haliday," as he used it with family rank in "Hym. Brit.," London, 1839.

Mr. Schwarz read a paper on "Economic Entomology in Southern Florida." He found most of the cultivated plants remarkably free from injurious insects, especially the semi-tropical ones. The Limes, however, have a serious enemy in *Artipus floridanus*, which is especially destructive to the buds on the young trees. Egg-plants and tomatoes were also badly infested, the latter by a West Indian Heteropteron (*Pthia picta*), not hitherto found in the United States.

Mr. Schwarz also spoke of the beetle (*Lasioderma serricorne*) in smoking tobacco. It is rarely found in tobacco manufactured in the North or in the very finely cut (so-called "Turkish") tobaccos. In tobacco badly infested the insect may be found in all stages at any season of the year.

WILLIAM H. FOX, M. D.,
Recording Secretary.

SPECIAL NOTES.

Australian Entomology.—We are pleased to notice that the *Garden and Field*, published monthly at Adelaide, is devoting more and more space to pure and applied science. Mr. J. G. O. Tupper is contributing a series of articles under the caption "Common Native Insects," and usually occupies all of the first page of this octavo journal. He gives popular descriptions of these insects, and names their habits.

The second page is usually occupied by Mr. Frazer S. Crawford, under the department heading "Notes on Garden Pests, etc., during the Month," and the third page is devoted to the reports of the meetings of the microscopical section of the Royal Society of South Australia.

In the April number Mr. Crawford occupies considerable space in a consideration of the statement by Mr. Skuse to the effect that the Lestophonus on Icerya and Monophlœbus is divisible into two species, and concerning which we have already published an article by Dr. Williston in No. 11 of INSECT LIFE. It seems that Mr. Skuse is now engaged upon a monograph of the Australian Diptera.

Mr. Crawford also devotes some space to a consideration of the Oyster-shell Bark-louse of the Apple (*Mytilaspis pomorum*), which it seems is abundant in certain sections of Australia. He also attacks our remark in No. 7 of INSECT LIFE (page 230) in which we expressed ourselves as being a little incredulous concerning his statement that infested leaves fall from the effects of an application of the resin-soap solution, while healthy leaves are not affected. Our incredulity was based upon our own experience, which is to the effect that healthy leaves are quite as badly damaged by most insecticides as leaves infested with scales.

The proposed Entomologists' Union.—As we have previously stated, the replies to our request for expressions of opinion in regard to the proposed general organization of economic entomologists have not been numerous up to date, but those which we have received have expressed so much enthusiasm in the plan that it begins to look like a matter of ultimate accomplishment. Mr. James Fletcher, Dominion Entomologist and president of the Entomological Club of the American Association

for the Advancement of Science, is in favor of issuing a call and organizing at the forthcoming meeting of the American Association which will be held in Toronto in August. It seems to us, that it will be an excellent idea to discuss the question thoroughly in all its bearings at this meeting, and, if possible, to permanently organize.

The Cave Fauna of North America.—Entomologists will be greatly interested in Dr. Packard's extensive memoir just published entitled "Cave Fauna of North America, with remarks on the anatomy of the brain and origin of the blind species," inasmuch as a large proportion of the animals treated are insects, arachnids, and myriapods. It is an octavo paper published by the National Academy of Sciences and has 156 pages with 27 plates and 21 text figures, together with a map of Mammoth Cave. We commend a perusal of this paper to the eminent astronomer who suggested that American cave insects should be much larger than those of Europe because our caves were the biggest in the world!

The Beetle which lived in an Insecticide.—Mr. Webster informs us by letter that the hellebore in which two adults of *Tenebrioides mauritanica* were found to have tunneled for a long time, as recorded upon page 314 of the April number of INSECT LIFE, has recently been tried at Lafayette upon gooseberry bushes infested by the Imported Currantworm, with the result that it was found to have retained sufficient strength to destroy the larvæ. This makes his former observation more satisfactory.

Bulletin on Root-knot Disease in Florida.—We are just putting through the press Bulletin No. 20 of this Division, which is entitled "The Root-knot Disease of the Peach, Orange, and other Plants in Florida, due to the Work of Anguillula," by Dr. J. C. Neal, the present entomologist of the Florida Agricultural Experiment Station. The publication of this bulletin has been somewhat delayed, as Dr. Neal's observations were mainly made during the early part of 1888, but his results have not been anticipated by other observers. The character and extent of the damage done by these "Eel worms" will surprise those who have not studied them in the South, and we expect that the practical results of Dr. Neal's short investigation will be great.

The wide-spread and abundant rains late in May of the present year seem to have accomplished the usual result of greatly lessening the numbers of Chinch Bugs in localities from which they were early reported.

NOTES ON SOME INJURIOUS AND BENEFICIAL INSECTS OF AUSTRALIA AND TASMANIA.

By F. M. Webster.

The following observations, made during a hurried visit to these islands, may not be entirely devoid of interest to American entomologists. The value of these random notes will, however, be of minor service only, to colonial entomologists, owing to the fact that in the majority of cases, I have not been able to secure the names of the species under consideration.

We arrived in Tasmania in season to witness the last of an invasion of the "Green Bug," *Diphucephala splendens*, one of the *Scarabæidæ*, of a brilliant blue color and about the size of our *Dichelonycha fuscula.* On the 29th of January we visited the garden of Mr. Bidencope, near Hobart, and found a great many of his plum and cherry trees had been entirely defoliated, and some of his apple trees had suffered nearly as severely by attacks of these beetles. Pear trees were only slightly injured, and the same was true of strawberry plants. Gooseberries and black currants were not touched. They are said to also attack grain. The beetles had first appeared about six weeks before, and at the time of my visit had nearly all disappeared, myriads of dead being found on the ground, and a few live individuals were still to be found on roses, of which they appeared to be especially fond. They are stated to occur about Hobart, regularly every four years, and are supposed to originate in the woods, on the Wattle. They occur in different localities during different years, as Mr. Keen, of Kingston, about ten miles south of Hobart, stated that next season would be their year to appear in his locality. The same gentleman stated that he had observed them periodically for the last twenty years, and had known them to be blown across the river Derwent, near Blackman's bay, in such swarms as to commit serious depredations. The same species is similarly destructive in the colony of Victoria, Australia. In method of attack, and, indeed, in the actions of the adult in general, they greatly resemble our "Rose Bug," *Macrodactylus subspinosus*, and there is reason to believe that they could be successfully fought with pyrethrum.

Another very injurious insect, and one that appears to be very numerous in Tasmania, is a species of Earwig (*Forficula* sp.) which eats into and destroys ripe fruits. It seems to me that these could be easily trapped, as I found them swarming in orchards and gardens, under boards and rubbish, and also on the bands on fruit trees used against the Codlin Moth which were literally alive with them.

The Codlin Moth appears to be doing serious injury in most of the Australian colonies. The band system, the only generally applied preventive, seems to result as unsatisfactorily as it has in America. Our Australian cousins appear to be well provided with laws, looking

toward the destruction of insect pests, and if they can devise more efficient means of fighting these insects, they will, in all probability, be in better shape to cope with the Codlin Moth and other like enemies of the products of their orchards and fields, than we are here in the United States. From what I saw in Tasmania, I am quite confident that there are at least two broods of the Codlin Moth in that colony.

The American Blight, as the *Schizoneura lanigera* is commonly termed throughout the colonies, seems to be much more troublesome than with us. Not only nursery stock, but also trees which have been transplanted and fruited for many years, are alike subject to attack. Not only are the roots attacked, as with us, but trunks and branches suffer also. The insect seems to have an especial liking for the scars on old trees that have been left by the pruning of large branches. Australian nurserymen claim that varieties of apples, worked on stocks of the Northern Spy and Majentin varieties, will be proof against this blight if the grafting is done nine inches to a foot above ground. The pest is devoured in immense numbers by an exceedingly valuable little yellow and black Coccinellid,* great numbers of which were sent home by Mr. Koebele, my own share in the matter being to reach the locality where they were the most numerous, after they had disappeared. However, I found the same Coccinellid in Tasmania, where it was engaged in devouring the Aphids infesting the heads of carrots, which were being grown for the purpose of producing seed. Another smaller but similarly colored species of Coccinellid, but with two transverse zigzag black bands across its yellow elytra, the anterior one being sometimes continuous, but usually interrupted, was also observed likewise engaged. This Aphid, which was exceedingly abundant in the garden of Mr. Keen, of Kingston, near Hobart, did not appear to affect any other portion of the carrot, except the seed heads, and these were literally alive with them. It is a species of *Rhopalosiphum.*

The only other Aphid observed in conspicuous numbers was *Aphis maidis*, which was swarming on the sorghum plants growing on the farm of the Agricultural College of South Australia. At the time of my visit, February 9, the winged adults and earlier stages were ensconced among the young folded leaves of the sorghum plants, precisely after the manner of our Corn Aphis with us, at a corresponding season. Professor Lourie, principal of the college, informed me that the insects were sometimes so abundant on the plant as to render it obnoxious to stock, thereby unfitting it for green fodder.

During my visit to the above institution, Professor Lourie also called my attention to one of his fields of grass land, the surface of which in many places was now as bare as the floor of his office so far as growing grass is concerned. The ground was thickly punctured with small, round holes, and on digging in the vicinity of these we found myriads of small vertical cells, several inches in depth. The major part of these cells were lined with a thin silky web, within each of which we

* *Leis conformis* Boisd.

found a slender caterpillar, of a whitish color, with brown head. Some of these larvæ were quite large, nearly an inch in length, others not nearly so large, but all Lepidopterous, and, judging from their general appearance, belonging to the *Pyralidæ*.* If Mr. Fraser S. Crawford would solve the problem of this insect, he would, I am sure, do his colony a great service, and if he will give us the results of his studies, he will furnish American entomologists some very interesting information.

Phytoptus pyri occurs generally throughout Australia, I believe, and I found it affecting the foliage of pears in the garden of Mr. Bidencope, of Hobart, Tasmania.

The Grape Phylloxera occurs at present, I believe, in the colonies of Victoria and New South Wales, and it looks as though, without a combined effort on the part of all of the colonies, the pest would soon get a firm foothold and cause serious trouble in the future.

What is known as the Bryobia Mite (*B. speciosa*) is quite injurious to stone-fruit trees, and also to the apple tree. I saw it working on some of the trees at the experiment farm at Dorkia, Victoria, and understand that it is very injurious elsewhere. Professor J. L. Thompson, of the Agricultural College of Victoria, is of the opinion that the mite originates on the Almond, and spreads from there to other fruit trees. They do not appear to injure the foliage, but cluster in great numbers on the young shoots, especially at the forks. Mr. Crawford also says that "they give a pinkish-gray color to the twigs, caused by the mixture of the white of the moulten skins, the red eggs, the pink of the young, and dirty green of the mature mites, all huddled together."

While examining wheat straws, in a field of grain near Hobart, Tasmania, I found an adult fly, a *Chlorops*, which was within the stem. In another straw, in the same field, I found a larva which resembled that of an *Isosoma*, but in attempting to secure it the wind blew it away, and I failed to recover it. It might, however, have belonged to the species of Diptera just mentioned. With this exception I failed to find any wheat-destroying insects, and I know nothing as to what extent the one observed might be termed destructive.

The Eucalyptus Scale, *Eriococcus eucalypti* Cr., occurs in great abundance about Hobart, Tasmania, as well as in Australia. In the vicinity of Hobart, the scale is destroyed by certain Lepidopterous larvæ which live and move about within a web-like sac covered with excrementitious matter. When these larvæ were abundant there were few Eriococcus. These carnivorous larvæ may belong to one of the two species mentioned in No. 10, Vol. I, of INSECT LIFE. If so, the breedings of the adult will show it.† Almost an equally industrious enemy of the Eriococcus, and very frequently associated with the preceding, was a large black *Scymnus*, ‡ which appeared to be in the midst of

* This insect is a Crambid which can not be determined from the material brought to Washington.

† This insect is evidently a *Dakruma*.

‡ *Scymnus restitutor* Sharp.

its breeding season. At the date of observation, January 28, these Scymni were nearly all pairing, and quite a large number of very young larvæ were afterwards observed in a box of twigs of Eucalyptus, infested by the scale, and which were collected at the time of observation.

So far as chronic depredators on farm crops are concerned, about the same state of affairs seems to exist in Australia as in the United States. White Grubs get in their work after the most approved American plan. A species of Migratory Locust originates in the interior and overruns considerable areas of farming country. A species of Caterpillar, with habits strangely like those of our Army Worm, marches through fields of grain, leaving destruction in its wake. I was informed that this pest was more liable to occur immediately following a wet winter, late sown oats being especially subject to attack. The Grain Moth, *Gelechia cerealella*, and the Rice Weevil, *Calandra oryzæ*, cause serious damage to stored grain.

Early in February it was stated that in the vicinity of Caisus, Queensland, "millions of caterpillars were clearing all vegetation before them."

TWO NEW SPECIES OF SCYMNUS.

By Dr. David Sharp, *Wilmington, England.*

[Note.—The Australian and New Zealand Coccinellids which were imported by Mr. Koebele to California in the hope that they will become acclimatized and feed upon the Fluted Scale were sent to Dr. Sharp for determination. As he finds among them an interesting new species, and as this is perhaps the most prominent of the species brought over, he has sent us a detailed description, which we publish below, together with one of a closely allied species which he had formerly received from New Zealand.—Eds.]

Scymnus restitutor n. sp.

Major, ovalis, niger, cinereo-pubescens, prothoracis margine anteriore utrinque antennisque pallide testaceis, illis apicem versus fuscescentibus subtus abdomine pectoreque sordide testaceis. Long. $4\frac{1}{2}^{mm}$.

The upper surface is closely and rather finely punctured, the pubescence suberect, a little curled; the thorax is rather narrow, so that the outline is discontinuous to a greater degree than is usual in the genus. The under surface is of a sordid yellow or pale red color, more or less infuscate at the sides and in front; the tarsi are fuscous red, and the claws are all simple, neither toothed nor lobed. The prosternal lines are rather long, and not at all curved in front; moderately distant at the front margin they continue in slightly divergent directions to the hind margin. The epipleuræ are unusually broad. Claws of the hind feet simple, those of the middle and front feet feebly lobed at the base.

Found in Australia.

This species does not resemble any other Scymnus known to me at all closely, except an undescribed species from New Zealand, which, owing to this circumstance, it may be well to characterize.

Scymnus circularis n. sp.

Rotundatus, convexus, nigerrimus, pube longiore pallide-grisescente irregulariter vetilus, fortiter punctatus ; abdomine rufescente, antennis tarsisque flavis, ad apices fuscis. Long., 3^{mm}.

Thorax sparingly punctured, with a very small flavescent mark on the anterior margin on each side. Elytra rather coarsely and not closely punctured, bearing a fine, rather long, almost white pubescence; this pubescence is not depressed, and the individual hairs do not take a straight or parallel direction. Prosternal lines subparallel, slightly curvate at the anterior margin, and slightly sinuate behind. Metasternum sparingly and rather coarsely punctate ; hind coxæ very widely separated. Front and middle claw with a long appendage extending the greater part of the length of the claw, and with free sharp extremity, so that the claw appears bidentate ; claw of hind foot with shorter lobe.

This species has been found by Mr. Richard Helms, in 1884, at Picton, South Island, New Zealand. A species smaller in size, but very similar in color and outline, has been found by Captain Broun on *Fagus cunninghami* in the North Island.

S. circularis is smaller and of much more circular form than *S. restitutor*, and differs in the structure of the claws and other important particulars.

A CASE OF LACHNOSTERNA DAMAGE.

In the August number of INSECT LIFE, pp. 58 and 59, we noted the defoliation of young plum and cherry trees in an orchard belonging to Mr. J. Luther Bowers, of Herndon, Va., occasioned by the attacks of the Twelve-spotted Diabrotica. This very unusual habit of the Diabrotica was accounted for in the article referred to by the fact that the trees had been planted on land that had been in melons the previous year, and we then felt little hesitancy in predicting that this beetle had not formed a new food habit and would not again be thus troublesome. We instructed Mr. Bowers to be on the lookout for it this spring, however, and on May 9 we received a telegram from him which read, "The bugs are destroying everything." This, while somewhat indefinite, from the previous experience with the Diabrotica, led to the inference that this beetle had re-appeared in force.

We immediately sent one of our assistants, Mr. C. L. Marlatt, to Herndon with spraying appliances, to learn the exact nature of the present outbreak, and to use such measures as would be advisable to prevent further injury. The following facts are gathered from his report:

Examination of the orchard, on the afternoon of May 9, showed that for the Plums and Cherries the amount of injury had not been overstated by Mr. Bowers. Certain varieties of the trees mentioned were entirely defoliated and nearly all were more or less injured, the outer half of the branches having been especially attacked. At this time, 6.30 P. M., the trees were comparatively free of insects; a single specimen of

the Diabrotica, and one of the well-known App le pest, the Imbricated Snout-beetle (*Epicærus imbricatus*) were found. A number of specimens of a plant-feeding bug (*Euthoctha galeator*) were observed piercing and sucking the juice of the tender terminal growth of the plum trees, causing the attacked portion to wither or "blight." This bug was supposed by Mr. Bowers to have caused the defoliation of his trees, and while this of course could not be the case, the very injurious habit of this insect, as noted, is worthy of record here. The ground beneath the injured tree was seen to be covered with dark-colored excrements of some large beetle, probably of the May Beetle (*Lachnosterna* sp.); and an examination of the soil about the trees showed numbers of these beetles concealed near the surface. The orchard was again visited after dusk, between 8.30 and 10, and these beetles were then found feeding on the trees in great numbers, thus removing any doubt as to the authors of the injury. As many as seventy-five were taken from a single small-sized tree, and on others already defoliated beetles were found clustered about the twigs gnawing at the petioles and bark. The common May Beetle, *L.* (*fusca*) *arcuata* Smith, was found to largely predominate; other species of Lachnosterna were associated with this common form, but in much fewer numbers. The determination by Mr. E. A. Schwarz of a considerable quantity of beetles collected as they occurred on the trees, here given, will indicate the comparative abundance of the different species.

Lachnosterna arcuata	161 ♂♂	313
	152 ♀♀	
dubia	2 ♂♂	2
fraterna	5 ♂♂	6
	1 ♀	
hirticula	12 ♂♂	24
	12 ♀♀	
tristis	6 ♂♂	15
	9 ♀♀	

Mr. Bowers states that the injury of the present year, while more severe, is not different from that of last year, and also that he then saw similar excrements about the defoliated trees. This would indicate that the May beetle may be charged with a considerable portion of the last year's injury; the attacks of the Diabrotica later in the season only aiding in the work of destruction, although Mr. Alwood's observations as repo rted in our previous article are not to be discredited.

The smooth-leaved sorts of Plums and Cherries were this year, as also last, especially attacked. The Apple and Pear trees, among which the others were planted, were, however, uninjured. The first mentioned trees in the following list were most severely attacked; those marked with a star were injured the previous season also. *Plums*—German Prune,* Shropshire Damson,* General Lee,* Green Gage, General Hand, White Egg, Wild Goose; *Cherries*—Gov. Wood,* Black Tartarian, Napoleon Bigarreau. The Hansel Raspberry was also attacked both years. The May Duke Cherry and Weaver Plum were untouched.

The Plums and Cherries, about six hundred and fifty trees, and the Hansel Raspberry were sprayed May 10 with London purple and water in the proportion of 6 ounces of the former to 50 gallons of the latter—a Nixon pump and nozzle being used for this purpose. Concerning this application, Mr. Bowers writes, under date of May 14, as follows :

The bugs were less Saturday night (May 11). Last night I found only from three to eight per tree ; yesterday I found some dead under weeds and grass. I shall spray about Friday or Saturday. We have had very heavy rains, and I think the poison is all washed off.

It is impossible from the above to determine whether the decrease of the beetles is owing to the spraying or other cause, such as the rain. Later communications from Mr. Bowers show that on account of continual rains during May he did not spray again. The trees were not damaged further, and the beetles became rapidly less numerous, although dead ones were not found. It is probable that the poisoned beetles were able to conceal themselves before the poison took effect.

NOTES ON PRONUBA AND YUCCA POLLINATION.*

By C. V. Riley.

Partly because of more pressing duties, partly because of a desire to make some special experiments, but chiefly in the hope that (after the fruiting season of the dehiscent Yuccas was over, and Mr. Hulst had been able to make more careful observations) he would himself gracefully amend his opinions to accord with the facts, I have deferred answering till now the remarks by Mr. Hulst on pp. 236–238 of Vol. II, Ent. Amer. The matter is too important to drop, and I have too much regard for my critic personally, and hope for his future entomologically, not to do what little I can to check an unfortunate tendency to hasty work and conclusion, noticeable in this as in some other of his late writings.

Mr. Hulst "confesses the corn" in reference to my first complaint, and is inclined to blame the report for his misrepresentations—an inclination which would have more of my sympathy were he not editor of the paper.

It is, however, far more important, from the scientific side, that he confess to the justness of my second indictment, and it is to this end that I return to the subject.

* In explanation of the controversial nature of this communication, it becomes necessary to refer to a dispute on this subject between the Rev. G. D. Hulst and myself in the columns of Entomologica Americana during the summer of 1887. The communication is a reply to Mr. Hulst's last publication on the subject, and is presented *verbatim et literatim* as written on my way to Europe in August of that year, and as mailed to him from England. Mr. Hulst is editor of the aforesaid journal, and exercised his editorial prerogative in declining to publish the communication. I have, therefore, concluded to present the paper to the Society, since it discusses matters of considerable scientific interest.

Mr. Hulst adheres to his belief "that there must be very extensive fertilization of the dehiscent species of Yucca by the agencies of bees and other insects." He does not bring forth a single definite fact or observation of actual pollination to prove or sustain the belief, but rests it on the following grounds:

1st. That Meehan found that the mere application of pollen to the papillose apex of the stigma is sufficient for fertilization.

2d. That he (Hulst) has seen honey-bees within the open as well as the partly open flowers, as also other insects, Aphides and Coccinellidæ being particularly mentioned.

3d. That not one in ten of the capsules subsequently examined by him showed the larva.

4th. That he is informed that dehiscent species of Yucca do ripen seeds in Europe.

Such are the negative arguments upon which rests his belief in the face of all the *facts* I have put on record. Let us consider the former briefly in their order.

1st. My good friend Meehan has written much on the fertilization of Yucca—much, too, that has not shown the keenest penetration nor the strictest accuracy. But, in candidly admitting his errors when shown to be wrong (as he has done to the writer, and, I have reason to believe, to Mr. Hulst, who sought his support in the belief here combated), he has proved himself to be the true naturalist. I am familiar with his experiments, having witnessed the results, and can best express my own opinion by quoting from a letter from the late Dr. G. Englemann (written January 10, 1881), in which, among other things, he says:

> As to Meehan's operations, I have seen myself the fine, large, well-filled pods of *Yucca angustifolia* raised by him by his artificial method. He says he punches an anther into the stigmatic cavity. Whether he or anybody else could distinguish whether the pollen adheres only to the papillose (not stigmatose) apex or gets into the liquor that fills the cavity when the stigma is ready to conceive, is a question (or no question)!

Meehan's experiments were made on a species in which, as I have elsewhere shown, the stigma is shorter and the stigmatic liquor more abundant than in *Yucca filamentosa*, and it may be that for these or other reasons it is more easily pollinized by hand or by other means than by Pronuba. But I have followed up his experiments, and made many others during the past seven years, on *filamentosa* and *aloifolia*, with results that convince me that application of the pollen to the papillose apices only is not sufficient to insure fructification, at least in those species. My experiments have been made in the afternoon, evening, and morning, with flowers one day, two days, and three days after opening; with pollen from the same flower or from other flowers either on the same or other racemes, by touching the mere apices with anther or brush, and by forcing the pollen by either conveyance into the stigmatic tube. In these experiments, which have not yet been published, and which it is unnecessary to detail here, I have endeavored to guard

against all influences, such as the condition of the plant and the weather, which might affect or vitiate the results. These may be summed up thus:

(1) Dr. Englemann's limit of time during which fertilizations may take place must be extended so as to include the second evening, and even the second morning, after the opening of the flower.

(2) No seed has been produced by merely touching the apices of the stigma with the pollen, though partial fertilization may take place and cause the growth of the fruit for a varying period, generally only three or four days. When the pollen is thrust into the tube (the mode of conveyance making little difference) fertilization is much more certain, but even here is rarely sufficient to produce ripe seed, the upper part of the pod often filling well, but the basal part not filling, and at last withering, so that the fruit ultimately falls off before ripening.

The conclusion is inevitable that *angustifolia* is more susceptible to artificial pollination than the species which I experimented with, and that Pronuba far excels man in the perfection with which she performs the act. She has the power of fertilizing all the ovules, at which no one will wonder who has carefully watched her, because the act of pollination is normally repeated several times, first from one of the angles between the apices, then from another, and, as Prof. William Trelease has shown, the tongue is used, in addition to the tentacles, to push the pollen down to the bottom of the tube.

2d. I have made careful search the past summer, and have had my associates, Messrs. Howard, Pergande, and Lugger, assist in the search for honey-bees in or about the Yucca flowers in Washington. There were over two hundred stalks under observation, most of them of easy access, on the grounds of the Department of Agriculture. Neither of the three gentlemen mentioned detected any bees, but I succeeded on two occasions, and each time between 9 and 10 a. m., in finding a single bee flying about the flowers. In neither case did the bee make any attempt to enter, but in each it probed around the outer base of the flower in search for nectar, and soon left evidently without being able to get much. These facts I record not in any way to cast discredit on Mr. Hulst's statement, but rather to show how very different from his own has been my experience in this direction, both in St. Louis and Washington. Not that I place much faith in the constancy of bees, which are known to be somewhat fickle in their tastes according to season or colony, a fact that may account for the difference in our experience, as may also the presumption that *Apis mellifica* is more abundant in Brooklyn than in Washington, or, again, the known fact that *Yucca angustifolia* is less scant in nectar than its filamentose congener. Be that as it may, our *Apis* has plainly, so far as observed, been after nectar, and has shown no disposition whatever to go near the stigma, and this fact is, as I have learned, corroborated by Professors Cook and Beal, of the Michigan State Agricultural College, where, for the first time

this year, they have observed honey-bees about the Yucca flowers. It is further corroborated by experiment which I made this summer of confining bees to the flowers within a gauze inclosure.

As for pollination by other insects, *Chauliognathus pennsylvanicus*, which feeds on both pollen and the nectar, is the most common species found in the flowers, and by virtue of these habits and its peculiarly modified mouth-parts, is most to be suspected; yet I have carefully watched it for years, only to be convinced that it never either assists or competes with Pronuba in the act of pollination.

3d. This argument has already been disposed of in my previous communication (Vol II, p. 238, summary iv), and it is only necessary to add, that until Mr. Hulst is more exact, and will tell us what proportion of his pods containing no larvæ also showed no signs of oviposition (*i. e.*, how many were perfect without sign of puncture or constriction or irregularity about the middle), we shall not even know how many the little moth pollinized without getting a chance to perform the other (to her) important act.

4th. This is contrary to my own experience in Europe, and to all authoritative record familiar to me, and until Mr. Hulst gives us his authority and the evidence, it were sheer waste of time to further discuss the point.

I have thus disposed of all the valid arguments brought forward by Mr. Hulst to sustain his position on this matter. I may briefly notice, however, a little satire which he indulges in at my expense, and a quite irrelevant assertion which happens also to be incorrect.

As one deeply interested in apiculture and a practical bee-keeper twenty-seven years ago, it was perhaps unpardonable in me not to qualify the statement about bees not being attracted to white flowers. Both Müller, in his "Alpenblumen," and Lubbock, in "Ants, Bees, Wasps," etc., have shown that bees prefer blue and purple to white flowers, and this is what was meant on the face of my language, so to speak; but Mr. Hulst has naturally made the most of the *lapsus*, and scored a point where every other point is against him.

The assertion which I would call attention to, and which is entirely beside the question at issue, is that "we are indebted to Dr. Engelmann for the discovery of the fact that Pronuba is an agent in the fertilization of Yucca."

Whatever may have led Mr. Hulst to make this assertion, it is simply untrue, and the facts, which I may as well put on record here, are these: In June, 1872, Dr. Engelmann, who then knew full well that Yucca needed extraneous aid in fertilization, called my attention to this fact, and to the further fact that insects, especially white moths and soldier-beetles (*Chauliognathus*), were common in the flowers. He made no observation whatever upon insect pollination, but wished me to study the question. The discovery that Pronuba was the agent was my own, as were all the subsequent discoveries in reference to the in-

sect made that year; but they were always communicated to him, and often shared with and witnessed by him.

My first paper on the subject was read in August, 1872, before the A. A. A. S., at its Dubuque (Iowa) meeting, and presented to the Academy of Sciences of St. Louis at the meeting for September 2, 1872. Dr. Engelmann's "Notes on the genus Yucca" were presented to the same Academy September 16, 1872. Both papers are printed in Vol. III of the Transactions of the Academy, Dr. Engelmann's preceding, because leading up to mine. In his paper Dr. E. says: "The *suspected* insects were handed over to my friend Mr. C. V. Riley, who thereupon took up the zoological part of the investigation, the surprisingly interesting results of which are detailed by him in the succeeding paper" (Trans., etc., III, p. 19), and I distinctly express my indebtedness to him "for drawing my attention to the fact that the plants of this genus must rely on some insect or other for fertilization." It is quite probable that but for Dr. Engelmann's suggestion I should never have made the investigations, and he should share with me whatever honor attaches to the discovery. If this is what Mr. Hulst means, his language is unfortunate. Dr. Engelmann was, during my residence in St. Louis, at once my friend, companion, and master in natural-history matters, and I have too much reverence for his memory to allow to pass unchallenged what he himself would repudiate were he still among us. As soon as I had learned that Pronuba was the agent, he sent a brief announcement to the Bulletin of the Torrey Botanical Club (Vol. III, No. 7, July, 1872, p. 33), rather hastily referring to the insect as "a white moth of the genus Tortrix," and in a subsequent communication (*ibid.*, August, 1872, p. 37) he corrected the error and recorded some further facts in the life-history of the insect. In neither case was there any claim of individual discovery of the entomological facts, and these announcements must be read in the light of his subsequent more deliberate language, which I have quoted.

In conclusion, having already devoted more time to Mr. Hulst's opinions than they justify, let me add that another year's study of Yucca fertilization has not only served to confirm all that I have hitherto written, but still further to enhance the importance of Pronuba to the plant and the intelligent nature of her unique performances. Prof. William Trelease, who has made the only other careful observations on the subject which have come to my notice, has demonstrated (Bull. Torrey Bot. Club, Aug., 1886, pp. 135–141) that the stigmatic liquor is not nectariferous, but that the slight amount of nectar associated with the flowers is secreted in thin pockets formed by the partitions that separate the three cells of the pistil, and which open externally by a contracted pore from which the nectar is poured through a capillary tube (inclosed by the closely applied, but not outwardly united, lobes of the ovary) to the base of the pistil, so that nectar-feeding insects seek it not about the stigma, but at the base of the pistil or of the petals, whether within or

without. I have fully verified Trelease's statements by dissection and study of the insects seeking this scant nectar, and indorse his conclusion that while the observations serve to disprove any positive value of their nectar in the pollination of Yucca flowers, they add to the importance of Pronuba by showing that the acts of collecting the pollen and transferring it to the stigma are performed voluntarily and without food compensation as I was at first inclined to believe.

I have lately had the pleasure of studying *Yucca whipplei* in California and the remarkable Tree-yucca (*Y. brevifolia*) in the Mojave desert. The former is pollinized by *Pronuba maculata* Riley, and the latter by a most remarkably modified and adapted species which I expect to describe as *Pronuba paradoxa*.

Thus everywhere in the United States where Yucca nominally fruits we find it associated with its Pronuba.

I await with interest and curiosity any new discoveries in this connection, but, so far as present knowledge justifies anticipation, I should expect, where neither Pronuba nor Pronuba-like insect exists, to find the plant modified to more readily permit self-fertilization sooner than to find *Apis mellifica* the pollinizing agent, the opinion of Mr. E. L. Layard, of New Caledonia (who first expressed it in 1880—*Nature*, Vol. XXII, p. 606), and of Mr. Hulst, to the contrary notwithstanding. [*Reprinted from Proceedings Entomological Society of Washington. Vol. I, No.* 3, *pp.* 150–154, *read June* 5, 1888.]

NOTES ON SOME SPECIES OF INSECTS WHICH AFFECT THE UPPER PORTION OF THE STEMS OF SOME GRASSES.

By F. M. Webster.

There are several species among our common grasses which are more or less subject to injury at or near the upper joint, whereby that portion of the culm above is so injured that it will suddenly wither, turn yellow, and die, leaving the portion below this upper joint green and vigorous. Of the grasses thus affected that have come under my own observation, those most commonly injured are Blue-grass (*Poa pratensis*), Timothy (*Phleum pratense*), Bottle-Grass (*Setaria glauca*), and Panic Grass (*Panicum crus-galli*).

The extent to which Blue-grass is subject to this attack in the United States, east of the Mississippi and north of the Ohio Rivers, has attracted considerable attention, as it has also in Canada.

In his Third report as State Entomologist of New York, page 96, Professor Lintner calls attention to the fact that similar injury to this grass was observed long ago and recorded in the Quarterly Journal of Agriculture and Science, I, 1845, page 263. Professor Lintner in this notice

states that he had recently received specimens of injured grass from Emmett, Ohio, and also from Union Springs, N. Y., but was himself unable to determine the nature of the depredator. In one of the stems of grass sent from Union Springs he found some globular, transparent, rather large eggs, which had been placed under the sheath near the joint. These eggs hatched lepidopterous larvæ, which fed within sections of grass stems with which the professor supplied them, but did not reach maturity.

In his review of this notice, Prof. J. H. Comstock, in the *American Naturalist*, vol. 22, No. 255, page 260, stated that he had, thirteen years previous, published a notice on the subject, giving an account of the depredations of a species of Thrips, *Limothrips poaphagus* MS., the description of which he had never published.

Professor Comstock states (*loc. cit.*) that the young insect pierces the stem of the grass, just above the upper joint, causing it to shrink, and all parts above the injury to die. He also says that the insect obtains its growth under the sheath, at the point stated, after which it crawls forth, and can be swept from the grass in great numbers. He further states that it occurs first, each season, on the Blue-grass, which it injures the most severely, and later on Timothy and other grasses. He has not, however, been able to complete the life-history of this interesting insect.

In the Thirteenth Report of the State Entomologist of Illinois, Prof. S. A. Forbes, in a foot note on page 22, calls attention to this injury to the stems of Blue grass and Timothy, stating that, judging from the appearance of a single pupa, found by him under the sheath outside the stem of Timothy, the injury to the grass was not due to *Meromyza americana*, but that the pupa found by him belonged to a species of Chlorops; but he was unable to say to what extent the species figured in the injury to the two grasses named.

In his report as Entomologist to the Department of Agriculture of Canada for 1885, p. 11, Mr. James Fletcher devotes considerable space to the discussion of similar injuries to both Blue-grass and Timothy, giving reports from a number of his correspondents showing that the damage there is quite a serious matter. The major portion of Mr. Fletcher's correspondents appeared to attribute the injury to the work of the Joint Worm, but a Mr. Brodie, of Toronto, had found the larvæ of a fly (*Chlorops*) doing much harm in several townships in the county of Ontario.

In his report as Entomologist of the Dominion Agricultural Experiment Farms for 1888 the same gentleman again refers to the subject, and reaches the following conclusion:

> Now, from the above observations and some others mentioned below, made by trained entomologists, it is perfectly certain that there are injuries to grasses by different insects, the effects of which are very similar in appearance, and all of which would be classed under the head of "*Silver-top,*" but for each of which a different treatment might be necessary.

Professor Fletcher states that while the injury appears first on *Poa pratensis*, it is afterwards observed on Timothy, *Phleum pratense*, Conch Grass, *Triticum repens*, *T. caninum*, and *Poa serotina*.

In June, 1886, while at home from the South for a short time, and while examining a quantity of injured Blue-grass stems, I found two pupæ resembling, in a general way, that of *Meromyza americana*, but smaller, and agreeing reasonably well with the description given by Forbes of the specimen found by him in Timothy. Being obliged to leave home again in a few days, for an indefinite period, a quantity of injured stems from the immediate locality was forwarded to the Department, but no adults were reared from them.

From the appearance of injured stems of Blue-grass I am confident that there are at least two entirely different species engaged in this work, one of which is some species of Diptera, possibly identical with that found by Forbes, in Illinois, and also with the species observed in Canada; the other belonging to some species of insect which extracts the juices of the culm without destroying the tissue. Both of these insects, if there are not, indeed, a much larger number engaged in this work, without doubt occur in Indiana.

Early in August, 1884, in the vicinity of Oxford, Ind., I found many of the stems of Panic Grass, *Panicum crus-galli*, infested just above the upper joint with a larva, in some respects resembling that of *Meromyza americana*. From a quantity of affected stems I reared a considerable number of adult flies, which proved to belong to an undeterminable species of *Chlorops*. These larvæ are much larger than those found in Blue-grass in 1886, and are of distinct species without much doubt.

Near the same locality, and about the same time, I found the Bottle Grass, *Setaria glauca*, affected in much the same manner, and rather expected to find the *Chlorops* larvæ doing the injury; but an examination revealed the fact that these larvæ were Coleopterous, and they were afterwards determined by Professor Riley as those of *Centrinus picumnus* Hbst., a small snout beetle, of the family Curculionidæ, and not uncommon in Illinois and Indiana.

Another larva, differing from either of the preceding, was observed burrowing in the terminal internode of a species of grass belonging to the genus Muhlenbergia, possibly *M. mexicana* Trin. This last larva was lost in the mails, and I have not since observed them affecting this grass. I have not yet been able to rear from or even observe any insect burrowing in the stems of Timothy; but there is scarcely a year that some of the heads do not turn white, in June, from some injury near the upper joint.

EXTRACTS FROM CORRESPONDENCE.

The Mole Cricket as a Harbinger of Spring.

I send you herewith an insect locally known as the "Mole-bug," from the fact that it burrows a track or "run" just under the surface of the ground, very much as the mole does, and you will see, if the specimen reaches you in good condition, that its forefeet are very much like those of the mole. You may be familiar with the habits of this insect, and then you may not. The object I have in sending you this specimen is because of this very interesting fact, that the first appearance of the "Mole-bug" in the spring of the year is a sure indication that winter is over—that spring has come—that there will be no more cold weather. The "Mole-bug" announces his appearance just a little before dusk of an evening by the peculiar grating nasal sound it makes, in an unbroken repetition of tay-tay-tay-tay, which can be heard for a considerable distance. He is very shy, and not easily approached without the risk of disturbing his evening song, and causing him to seek safety by making a hasty retreat into his run, which he has made under the ground, from just outside of which he has been sending forth his harsh music.

I have been noting the first appearance of these insects for several years, and an old gentleman of my acquaintance, who first called my attention to this little prophet, says he has noted its first appearance for a great many years, and our observations warrant the assertion that when the "Mole-bug" is heard winter is over and spring has most emphatically arrived. It usually makes its appearance between the 20th and 30th of March; but the first one I heard this season was on the 17th of March, earlier than usual. I do not know that this information will be of any use to you, but then it is like taking a bread pill—if it does not do any good it will not do any harm. Farm work is progressing very rapidly in this section; the rain-fall during this month has been below the average, and no thunder or wind storms up to this date, which is something very unusual.—[B. T. Webster, Louisville, Miss., March 29, 1889, to Prof. R. B. Fulton, of the University of Mississippi.

First injurious Appearance of the Army Worm in Florida.

I fully believe that I have the true Army Worm of the North (*Leucania unipuncta*) on my place. They were first noticed about ten days since in a field of very rank Oats, which were shooting to head and about waist high. The worms exist in immense numbers. They have eaten the Oats to the bare stems and are spreading over the farm, destroying as they go. Ditches do not stop them, and I am now burning straw around the field during the middle of the day, at which time they are in motion. If you desire it I will forward specimens. They may prove to be the *Laphygma frugiperda*, but I believe them to be *Leucania unipuncta*. I have not heard of them anywhere else in the country, and have never known them to appear sooner than July or August until now.—[J. V. Dansby, Pensacola, Fla., March 1, 1887.

REPLY.— * * * The appearance of either the true Army Worm (*Leucania unipuncta*), or of the Grass Worm (*Laphygma frugiperda*), at this season of the year in such enormous numbers as you describe is a matter of great interest. You are doubtless right in supposing that it is the first named of these two insects. We have already recorded the occurrence of the true Army Worm in Florida during late winter and early spring, but have never known of its occurrence in such injurious numbers. * * * We should be very glad to receive a large number of specimens from you. These should be inclosed in several small boxes together with a supply of grass or other food, and sent by mail. We hope that you will give us every detail of this invasion.—[March 5, 1887.]

SECOND LETTER.—Yours of the 5th instant received to-day. I now forward by mail four boxes of specimens: No. 1, gathered from Texas Blue-grass; No. 2, from Radish; No. 3, from green Peas; No. 4, from Oats. I have placed their respective foods in the boxes with each. * * *—[J. V. Dansby, Pensacola, Fla., March 9, 1887.

SECOND REPLY.—Yours of the 9th instant, with four boxes of Army Worms, came duly to hand. They are the genuine Army Worm (*Leucania unipuncta*), and therefore you were right in your surmise. This is, as stated before, an interesting fact, as the insect has never been recorded as occurring in injurious numbers so far south as Pensacola. The probabilities are that as soon as this brood of worms disappears you will not be troubled with it again for some years to come. This same insect occurred in great numbers at Huntsville, Ala., in the spring of 1882, but in this southern location its natural enemies were so abundant that the large brood was almost entirely killed off, and has not been destructive in that locality since. You will probably have a similar experience at Pensacola.—[March 14, 1887.]

THIRD LETTER.— * * * In your communications you expressed a wish that I would give the details of this worm invasion in this section. They were first observed in a field of Oats on the 21st of February, though doubtlessly they were there some time before. Adjoining the Oats is an orchard which was in grass the past season. Last summer and fall were remarkably dry. For two weeks before the worms were noticed the weather was warm and foggy, with very little sunshine. The worms first appeared on the side next the orchard. The Oats were about 2 feet high, very luxuriant and growing rapidly. The worms seemed to go under the thick leaves of the bunches of Oats at night, fed most freely from early morning until noon and from that time until late in the afternoon they were in motion, crawling in every direction seeking new pastures. By the 15th of March, which was about twenty-five days after first being observed, the most of them had gone into the pupa state. Their favorite place for transformation seemed to be just barely below the surface of the ground, around the Oat stubbles, where they can now be found in large numbers.

On the evening of the 28th of February a heavy rain fell, followed by a norther, and on the morning of the 29th it was quite cool, with considerable frost, to which the worms appeared to be perfectly indifferent. A heavy rain also fell on March 8 without any effect. Besides the Oats, the worms manifested a liking for Wheat, Blue-grass, Corn, green Peas, Cabbages, and Radishes; also did some damage to Tomatoes and Egg-plants. They seemed to be indifferent as to Lettuce, Onions, Strawberries, Dewberries, Melons, and Cucumbers, neither did they feed on Butler Weed (*Gnaphalium purpureum*) or Mexican Clover (*Richardsonia scabra*), to which they had abundant access. In conclusion, I will state that my Oats are entirely destroyed, and that I saved my other crops by the free use of London purple. Although not a great many were killed by the poison, yet they would refuse to feed upon any plant to which it was applied. I am of the opinion that had I used it freely upon my Oats at the beginning they could have been saved from destruction. I have heard of no worms anywhere in the country except on my place. * * *—[J. V. Dansby, "New Farm," near Pensacola, Fla., March 18, 1887.

The Camellia Scale.

Can you suggest any remedy for this insect on my Camellias? The trees are about 12 feet high and all the leaves on the under side are covered with the insect; some look as if there were cotton growing on the leaves. It appeared here about five or six years ago. I have washed every leaf with whale-oil soap at one time, at another with resin soap, and at another with castor-oil, none of which has done any good. About the middle of March, when the trees make new leaves, all the old ones fall; the insect then appears about May or June on the new leaves. I send some of the leaves by this mail.—[Robert Halliday, Liberty Road, Baltimore, Md., January 14, 1887.

REPLY.—* * * The insect on your Camellias is the Camellia Scale (*Fiorinia camelliæ* Comst.). It has previously been observed only on the Camellias in the hot-houses of this Department, but has been so thoroughly treated that it is not common. You will find a good remedy in the application of a kerosene-soap emulsion, made according to the following formula:

Kerosene	2 gals.
Common soap or whale oil soap	½ lb.
Water	1 gal.

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force pump and spray nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens on cooling and should adhere without oiliness to the surface of glass. Dilute one part of emulsion with nine parts of water. —[January 15, 1887.]

The Australian Lady-Bird.

In several of my previous letters to you I have expressed my belief that the red-and-black Lady-bug from Australia would prove more effectual as a destroyer of the Icerya than any of the other predaceous or parasitic insects recently introduced into this State from Australia, and I am now able to state definitely that such is the case. The Orange tree covered with a tent at Mr. Wolfskill's, in this city, where I colonized the first two or three consignments of these Lady-bugs, is now almost entirely free from living Iceryas, while on the adjoining trees many larvæ of this Lady-bug are now busily engaged in destroying these pests, and already the good work accomplished by them is apparent to the most casual observer. I have also colonized them in several localities in this part of the State, and in every instance the attempt has proved successful, the Lady-bugs apparently thriving quite as well here as they would in their native land.

From time to time I have carefully examined the Iceryas on the tree under the tent where I colonized all of the *Lestophonus iceryæ* received from Australia, but thus far have found no outward signs of parasites, although several of the Iceryas that I dissected contained larvæ of the Lestophonus. It is possible that in time this parasite may accomplish much good by destroying the Iceryas, but the work of the Lady-bug referred to above is so much more rapid and effectual that it seems only a waste of time to bother any longer with the slow-going Lestophonus. Certain it is that these two species could not live together in the same locality, since the Lady-bugs would devour all the Iceryas and the Lestophonus could not help itself. In comparing the work accomplished by the Lady-bugs with that of the Lestophonus, I am strongly tempted to uncover the tree inhabited by the Lestophonus and allow the Lady-bugs to accomplish the work that the slow-going Lestophonus should have done but has not. The latter may be an effectual destroyer of the Monophlœbus, but it is no match for the Icerya, and the latter would certainly have continued to thrive and spread devastation among our orange groves but for the timely arrival of the Lady-bugs, whose persistent, Yankee-like energy will soon result in sweeping this curse from our orange groves.—[D. W. Coquillett, Los Angeles, Cal., May 1, 1889.

It gives me the greatest pleasure to report that the colonization of the parasites upon my trees appears to have resulted remarkably well, so far. Large numbers have hatched on each of the three trees upon which we placed the boxes, and, better still, Mr. Scott Chapman and myself found three larvæ upon an adjoining tree, showing conclusively that the Lady-birds were already distributing their eggs through the orchard.—[J. R. Dobbins, San Gabriel, Cal., April 27, 1889, to D. W. Coquillett.

Valgus canaliculatus a Quince Enemy.

I have been watching for several years to see the enemy of the Quince that eats out the fruit buds when they are quite small. I send you a small beetle which I have

just caught in the act. You can no doubt give its name and life history. If new to you it will be of interest, and if not it may be a new discovery that it eats out the fruit buds of the quince. I should have been glad to have included it in the list of insect enemies when writing my book, but could not be certain what it was that did the mischief. Perhaps you may have it figured already, if not it might be well to preserve it for such use. Inclosed is a sample of the bud as eaten out.—[W. W. Meech, Vineland, N. J., May 1, 1889.

REPLY.—Your letter of May 1 and the beetle eating quince buds have been received. The new enemy is a Scarabæid beetle known as *Valgus canaliculatus*. It is a comparatively common species, but I believe has not before been recorded as having this habit. The larva of Valgus lives in decaying wood.—[May 13, 1889.]

Application to prevent Icerya from ascending Trees.

* * * I have recently been experimenting with various viscid substances to be placed around the trunks of trees to prevent the Iceryas from ascending them, and find that the following gives very good satisfaction: Resin, 4 ounces; beeswax, 1 ounce; cotton-seed oil, 5 fluid ounces. The resin and beeswax are first melted over the fire, the cotton-seed oil then added and the whole thoroughly stirred; when cold it is ready for use. When spread on the trunk of a tree this remains moist for over a week, but a better plan would be to apply it to the outside of a bandage of some sort previously placed around the trunk of the tree to prevent injury to the bark. This will make the process of washing the infested tree with pure cold water thrown upon it with considerable force still more effective by preventing the Iceryas that have been washed off from again ascending into the top of the tree.—[D. W. Coquillett, Los Angeles, Cal., April 1, 1889.

Lasioderma serricorne injuring Cigarettes.

I send you by mail to-day a few larvæ and beetles. With the limited literature at my command I have identified the insects as *Byturus unicolor*. Am I right? They are doing much damage to dry leaf tobacco and cigarettes. While in the egg or young larva state the tobacco is made into cigarettes. When the larva matures, it eats out through the paper, thus destroying the draught of the cigarette. They also cut through the paper package. Can you direct me to the literature on this insect, and has it ever come under the notice of the Department as injurious to tobacco or cigarettes? I have a quantity of tobacco infested on hand and am going to study the life-history and also experiment as to remedies, if none are yet known. Do you know of any remedies, or could you suggest any line of experiments? Would it be effectual and safe to use bisulphide of carbon in tight boxes, with the cigarettes still in the paper packages, if the mouth of the packages were left open? If so, would it be necessary to remove the cigarettes to new packages in order to air them and clear them of the fumes of the bisulphide? I ask this as many cigarettes not yet cut could be saved.

The experiments that I have made show that the larvæ and adult beetle in the cigarette can be destroyed with the fumes of the bisulphide of carbon without any injury to the cigarette. My question now is, will the same process destroy the *egg* of the beetle? If so, then the use of bisulphide will be entirely successful. In the case of leaf-tobacco which is packed in large hogsheads, would the fumes settle and permeate through all the leaves, and kill egg, larva, pupa, and adult? Or would it be necessary to transfer to a box with crates in it, so that the leaves could be somewhat separated? The process of steaming and cutting in preparation of the cigarette tobacco does not seem to destroy the young. * * *—[Geo. F. Atkinson, Chapel Hill, N. C., January 11, 1886.

REPLY.—In reply to yours of the 11th instant, I would state that the insect which you send is a species which is found all over the world, feeding in Cayenne pepper,

spices, tobacco, and other pungent substances. It is *Lasioderma serricorne.* This injury to cigarettes has been observed in other localities, and samples of damaged goods have been sent to the Division before. In tobacco warehouses in Baltimore particularly it has done much injury to cigars and cigarettes, preferring the latter. It is very abundant one year and then disappears almost entirely for a number of years. It is a night flyer, and enters store-houses through open windows or cracks at night only. The best way to destroy the larvæ and eggs is to thoroughly steam all the tobacco. The steaming which is done in the preparation of cigarette tobacco is either not thorough enough or the tobacco is left for a longer or shorter time after steaming and before being made up, and in this interim the beetles enter it. Many precautions should be used. Cut tobacco should be kept in tightly-closed boxes when not in use. All manufactured cigarettes should be packed up at the close of the day's work, or if this be not possible, they should be closely covered with flannel cloth. All the windows in the building should be closed at night, and its general cleanliness should be carefully looked after. No dust heaps should be allowed to accumulate, and the walls should be kept whitewashed. The bisulphide of carbon would hardly be a safe or pleasant remedy in this case. It would be of considerable interest if you would carefully rear the insect and note its habits and natural history, particularly the length of time of the different larval stages and the number of annual generations. —[January 18, 1886.]

Injury by the Fall Web-worm in Texas.

* * * The "Fall Web-worm" has been doing great damage to the trees on this island, more this year than formerly, owing, I presume, to the little attention that has been paid here to its ravages. It seems to prefer the leaves of the Mulberry. I have two large Black Mulberry trees, which the Web-worms would defoliate in a week, but I have kept the numbers down by cutting off the branches as I noted the webs on the leaves. The worms are now coming out for the third time this season.—[E. P. Clegg, Galveston, Tex., September 3, 1888.

Dryocampa imperialis on Elm and Linden.

I herewith send you a larva that I have never seen before. It feeds on the Linden tree, Norway Spruce, and Elm tree. I can not find it in any book I have. It is about the size of the Cecropia Silk-worm (*Attacus cecropia*), has long white hairs all over it, and the warts are yellow. Please send me the name of it if you can.—[Victor Braidwood, Vineland, N. J., September 10, 1888.

Reply.—* * * The worm sent is the larva of the Imperial Moth (*Dryocampa imperialis*). It is known to feed on the Button-wood or Plane-tree, Sweetgum, Alder, Willow, Pine, Spruce, Tamarack, but is not included in Packard's Report upon Forest Insects, Bulletin 7 of the U. S. Entomological Commission, among the enemies of the Elm or Linden; so this fact may prove of interest. The caterpillars attain their full size from the middle of August to the last of September, when they descend from the trees to go into the ground. The moth appears in June and is of a fine yellow color, sprinkled with purple-brown dots, with large patches at the base of the wings, and with smaller spots near the middle and a wavy band of purplish-brown toward the hind margin of each wing. It expands from 4½ to 5 inches.—[September 12, 1888.]

Larvæ of Tenebrio molitor in a Woman's Stomach.

I send herewith inclosed one of a couple of insects claimed to have been ejected from the stomach of a woman in an adjoining county, and sent me for diagnosis and treatment. It is not an Entozoa that I know or can find any information about. Please examine, name, classify, and tell me its habitat.—[John S. Apperson, M. D., Glade Springs, Va., April 30, 1889.

REPLY.—I beg to acknowledge the receipt of your interesting letter of the 30th ultimo. The specimen which you send is the common Meal Worm (larva of *Tenebrio molitor*). This is a common insect all over the world, feeding in corn meal and flour, and it is not unlikely that the story of its ejection from the stomach of a woman is correct. You can readily conceive how the larva could have been swallowed by her in corn-meal mush, which she naturally would not chew, and it is also readily conceivable that the worm would disagree with her and would cause vomiting. Such cases have been previously placed on record, and, though always interesting, are not remarkable.—[May 2, 1889.]

Another Note on the retarded Development of Caloptenus spretus Eggs at Manhattan, Kans.*

In 1874 Kansas was devastated by *Caloptenus spretus* (as you know), and much was published upon the subject, true and false. At the time I made many careful examinations of them on my farm in Marshall County; their eggs, etc. At that time, *after* they had deposited their eggs all over, the Agricultural College at Manhattan, Riley County, Kansas, had occasion to build a small blacksmith-shop on a plat of bare ground. This shop was used till the summer of 1880. In August of 1880 I conducted the Riley County "Teachers' Normal Institute" at Manhattan, and visited the "Agricultural College" daily. During that time the authorities had occasion to take down and remove the blacksmith-shop above-mentioned, and, lo! the ground covered by a floor was perfectly full of grasshopper (*Caloptenus spretus*) eggs. To see if they were still vital, we gathered great quantities of them and placed them in the sun, and they hatched the true insect—*Caloptenus spretus*. Placing some in gauze-covered boxes, I raised many through all stages to maturity, thus showing that the eggs deposited in 1874 had retained all their vitality under that building until 1880, or six years; for there had been none on that ground during that interval.—[F. W. Parsons, California, Mo., July 15, 1886.

REPLY.—* * * Are you perfectly sure of your dates in the case of retarded development of the eggs of *Caloptenus spretus?* Cases almost parallel to this are on record, as you will see if you will consult the American Naturalist for 1881, pp. 748 and 1007. One of these instances is reported by a Manhattan man, Mr. I. D. Graham, and in this instance the occurrence of the locusts at Manhattan is stated to have been in 1876. Are you sure that the blacksmith shop was built in 1874? It is such an interesting and important observation that you will pardon my desire to be very particular on this point. * * *—[July 19, 1886.]

[NOTE.—Subsequent correspondence with Mr. Parsons leaves doubt as to the date of building the blacksmith shop, which was probably 1876.]

GENERAL NOTES.

LINEN INJURED BY AGROTIS LARVÆ.

Mr. C. G. Barrett publishes a very interesting article in the March number of the *Entomologist's Monthly Magazine* (London, England), describing the serious damage done to the linen manufacturing industry in the north of Ireland by the larvæ of *Agrotis exclamationis*. The damage is done after the linen is removed from the grass upon which it has been laid out for bleaching. It remains upon the grass for some days or a week, and is then gathered up and laid in a heap, before

* See American Naturalist, vol. 15, 1881, pp. 748 and 1007.

the process of dipping. It is while the linen lies in these heaps that the injury is done. The larvæ unquestionably have crawled upon the under side of the linen while it was stretched upon the grass and have been gathered up with it. At night, being hungry and being confined in the heap of linen and under pressure, they act just as they would when under ground, using their strong jaws to gnaw through the cloth. The remedy proposed by Mr. L. M. Ewart, who investigated the subject and who was Mr. Barrett's informant, was to place the cloth directly in the dip after removing it from the grass, as no damage seems to have been done at any other time except when the cloth was piled in a heap, never when it is spread upon the grass. As a matter of course a thorough shaking of the cloth would answer the same purpose. Curiously enough the larvæ were found to stand immersion in the dip (a weak solution of chloride of lime) for several hours without apparent injury.

IMPRESSION OF AN INSECT IN PAPER.

A curious case of an impression of an insect in a piece of paper has recently come to our notice. Mr. John R. Giles, vice-president and general manager of the Giles Lithographic and Liberty Printing Company of New York, has sent us a piece of transfer paper of rice manufacture made in India, which contains a most perfect impression of a species of Lithobius, a genus allied to the Centipedes. All parts of the insect are readily discernible, and it is incorporated in the substance of the paper and forms a part of it. The specimen was no doubt accidentally entrapped in the pulp while the paper was in the process of manufacture, and passed unnoticed through the rollers in the subsequent stages of drying.

THE DESTRUCTIVE LEAF-HOPPER INJURING TIMOTHY.

Our former Missouri agent, Mr. J. G. Barlow, writes us under date of April 29 that some Timothy meadows in the vicinity of Cadet are infested by millions of small, dark-colored leaf-hoppers, specimens sent proving to be *Cicadula exitiosa*. They have already injured the grass to a considerable extent, and though so numerous are difficult to capture except by sweeping, on account of their extreme shyness and agility. This species was described by Uhler in the third volume of the *American Entomologist*, page 72. There is also an account on page 78 of the same volume of their infesting wheat fields in myriads in North Carolina from October, 1879, to January, 1880. In the Annual Report of this Department for 1879, pages 191 to 193, a full account of the insect and its destructiveness is given and special reference made to the above cases of damage in North Carolina, which were laid to the extreme mildness of the winter of 1879–'80. The species has heretofore been noticed as injurious only to winter wheat, to which Timothy grass may now be added.

THE SUNFLOWER A FOOD PLANT OF RHODOBÆNUS 13-PUNCTATUS.

In vol. 1, No. 6, p. 198, of INSECT LIFE, under the head of "The Food-habits of North American Calandridæ," only *Xanthium strumarium*, *Ambrosia*, and Thistle are given as food plants of this beetle. I found the larva of this species burrowing in the pith of the common garden Sunflower on August 21. There was a hole through the woody walls covering the pith, but whether bored from within or from without I could not determine, but suppose it must of necessity have been excavated from within, as it was located some distance from the ground. The larva, still within its burrow, was placed in a small box and the adult beetle found therein on September 8th, following.—F. M. WEBSTER.

PIERIS RAPÆ AND PROTODICE IN COLORADO.

We notice that Professor Cassidy, in a late bulletin of the Colorado Experiment Station, says that the Southern Cabbage-butterfly (*Pieris protodice*) is the most injurious of the Cabbage butterflies in Colorado, mentioning also *P. oleracea*, *Plusia brassicæ*, and *Ceramica picta*, but leaving *P. rapæ* entirely out of consideration. Scudder, in his paper on the introduction and spread of *P. rapæ* in North America, gives the year 1886 as the date of its introduction into Colorado. A dozen specimens were taken by Mr. David Bruce in the vicinity of Denver between August and October of that year. Inasmuch as *rapæ* usually practically replaces *protodice* in a year or so after its introduction, it seems rather remarkable that now in 1889, three years afterwards, *protodice* should still be the most injurious species in the State, and that in an account of this kind *rapæ* should not even be mentioned.

LIGYRUS GIBBOSUS INJURING CARROTS IN INDIANA.

On September 5, a plat of Carrots on the grounds of the Indiana Experiment Station was examined and the roots of the plants, from the surface of the ground downward to the depth of 2 or 3 inches, were found to have been gnawed, the cavities thus formed being large, irregular, and seldom extending inward beyond the cortical.

Further investigation revealed the depredators to be the adult beetles of this species, usually two and sometimes four being found about one plant, although comparatively few plants were affected, and the depredators were not very abundant. The injuries continued during the remainder of the month and October, but up to the 6th of December, when we left for Australia, we had not succeeded in securing eggs or witnessing oviposition, although both sexes of the beetles had been kept about potted plants. The crop was not seriously damaged, owing, no doubt, to the limited number of beetles.

The only other recorded notices of the destructive habits of this species are to be found in the Report of the Commissioner of Agriculture for 1880, p. 274, where the beetles are accused of destroying the garden

Sunflower, wild Sunflower, and Dahlias in Nebraska, and the larvæ of becoming quite injurious to potatoes in Texas.—F. M. WEBSTER.

THE SCURFY BARK-LOUSE UPON THE CURRANT.

Prof. Herbert Osborn has written us in reference to our statement, upon page 324 of No. 10 of INSECT LIFE to the effect that Currant had not previously been recorded as a food plant of *Chionaspis furfurus*, and that he had found it upon this plant in Iowa, and had mentioned it upon page 95 of the Bulletin from the Department of Entomology of the Iowa Agricultural College for 1884.

PHYLLOXERA AT THE CAPE OF GOOD HOPE.

We learn from the April number of *Garden and Field* that the Phylloxera is abroad in fifteen centers in the division of Stellenbosch and in two centers in the Cape division of Cape Colony. Bisulphide of carbon is being brought by the ton from England for use in treatment.

WHITE ANTS IN FENCES.

Prof. G. F. Atkinson records in a recent bulletin of the South Carolina experiment station the fact that long stretches of the board fences on the outskirts of Columbia have been seriously damaged by White Ants. The principal damage is done to the boards where they meet on the posts. It is particularly noticeable where a batten is nailed on at the joint. Professor Atkinson states that tar poured between the post and the boards soon after building the fence will act as a preventive.

A NEW BUTTERFLY PUBLICATION.

We have just received from Mr. A. Sidney Olliff of the Australian Museum, a copy of a little pamphlet of fifty pages entitled "Australian Butterflies: A brief account of the native families with a chapter on Collecting and Preserving Insects." The pamphlet is profusely illustrated with wood-cuts and the chapter upon collecting and preserving is valuable.

THE BOT-FLY OF THE OX.

We are glad to notice that the *Farmers' Review*, of Chicago, is undertaking an investigation relative to the damage to cattle and their hides from the larva of the Bot-fly of the Ox or Ox Warble-fly. The investigation is undertaken by means of circular, and the following specific questions are asked:

1. Are grubs common on the backs of cattle in your county?
2. What damage do they do?
3. Do buyers "dock" cattle in your locality on account of the grubs? If so, what loss in dollars and cents does this amount to on sales in the grubby season?

4. Do farmers realize that grubs are a great damage to their stock, and endeavor to prevent the trouble?

5. If any remedies have been used, state their nature and whether successful or not.

6. What proportion of beef cattle marketed from your county are afflicted with grubs?

7. What amount does your local hide-buyer deduct from the purchase price of a grubby hide?

8. What class, sex, age, or breed of cattle are most troubled by the grubs?

We shall be glad if any of our correspondents will take the trouble to answer these questions dire·t to Mr. A. S. Alexander, of the *Farmers' Review*, 134 Van Buren street, Chicago, Ill.

A NOTE ON MUSEUM PESTS.

In INSECT LIFE No. 7 (p. 222), Mr. John P. Brown notes the ravages of *Anthrenus varius* upon whalebone at Boston.

The same industrious little insects attacked the baleen belonging to one of the mounted whale skeletons in the National Museum and did some little damage before their presence was noted and a stop put to further depredations by liberal douching with a solution of arsenic.

Anthrenus is a dangerous pest on account of its small size and predilection for horn and feathers, but for downright mischief *Dermestes* is by all odds the worst enemy of zoological material, promptly putting in his appearance on every skin or rough skeleton that may have escaped the poison bath.

Dermestes maculatus is the species now on watch at the National Museum, and the writer thinks, though it is merely a matter of individual opinion, that this insect has completely driven away the weaker *D. lardarius.*

D. lardarius is by no means to be despised, but *maculatus* far exceeds it in strength and vigor, seeming to attack some objects merely for the purpose of displaying its destructive powers.

In several instances boxes used for the storage of skeletons were perforated by the lively larvæ until they looked as if riddled by shot, and crumbled to pieces in the hand.

The most curious object attacked by these insects, however, was a plaster mold made over the head of a some time dead monkey and stored away for the purpose of being used when the said monkey was mounted.

When taken down the mold was found to be pitted in many places by *Dermestes*; the dead bodies of larvæ fitted into the holes they had sunk in the flesh-tainted plaster leaving no doubt as to the origin of the pits.

Perhaps the palm should be awarded to the larvæ that bored through the side of a pasteboard box containing chloride of lime and succeeded in burrowing 2 inches deep in it before giving up the ghost.—F. A. LUCAS, *U. S. National Museum, Washington.*

THE PHYLLOXERA IN COLORADO.

Mr. Eugene Weston, of Cañon City, Colo., informs us by letter that there is some danger of the Phylloxera becoming a dangerous enemy in that part of Colorado. One of the vine-growers of his vicinity, evidently a man of conscientious principles and a good neighbor, found the Phylloxera in a lot of California vines that he had purchased, and at once dug up and burned six hundred valuable grape roots which he feared might be infested. But a leading nurseryman of the same place has been charged with sending out large quantities of vines this season which had been imported from California and showed indubitable signs of the disease. Mr. Weston informs us that the results will be closely watched and the necessary legislation secured if found expedient.

THE RHIZOCOCCUS ON GRASS.

Mr. James Fletcher, Dominion Entomologist of Canada, sends us some specimens of the egg sacs of a Rhizococcus on grass, which he received from a correspondent, Mr. A. H. McKay, of Pictou, Nova Scotia. They were found in large numbers over an extensive marshy flat in Cumberland County, Nova Scotia, every blade of dead grass having a Rhizococcus attached to it. This is the same species which is mentioned on page 345 of INSECT LIFE, Vol. I, as occurring on grass in Custer County, Dak., and this locality is the only one from which we had previously received it. It is undoubtedly a new species of this remarkable genus. Mr. Fletcher inclosed also with the specimens a dipterous parasite, which proves to be a species of Leucopis. The parasitism of this genus on Coccidæ is mentioned in a note on page 258 of the same volume of INSECT LIFE.

A NEW GRAPE PEST IN THE SOUTHWEST.

A beetle new to entomological literature in the role of a grape pest has been sent to us from Arizona by one of our correspondents, Mr. William J. Howerton, of Florence, Pinal County. It proves to be *Gastroidea formosa* Say, one of the Flea-beetles, of which the habits have not been previously recorded. The eggs from which proceed the only brood so far determined are deposited in January and February, in clusters on the under side of the leaves of the Cañagre or Tuberous-rooted Rhubarb, a native plant of Arizona, and the beetle's natural food plant. The imagos appear in great numbers in March and the early part of April, when they attack the leaves of the grape, and this year have done considerable damage to vineyards in Pinal County. Some vines are greatly damaged while others near by may be scarcely touched, and whole vineyards are apparently exempt while others within a quarter of a mile are considerably infested. At the date of our correspondent's letter, May 18, the beetles had relaxed their attacks upon the grape leaves and disappeared, nor were any eggs or larvæ to be found at that

time. The remedy, of course, will be to spray the Cañagre, upon which the beetles breed, with one of the arsenical mixtures, at the time when the larvæ are in full force feeding upon the leaves, which is February and March in Arizona.

AN ALEURODES ON TOBACCO.

Prof. P. Gennadius, Director of the Bureau of Agriculture, Ministry of the Interior, Athens, Greece, wrote us under date of March 25 that he had found an Aleurodes on the Tobacco plant, a description of which he had recently published in a Greek journal which we have not seen. We can not at present tell whether Professor Gennadius named the species, though we infer not. He wrote us later (May 21), sending samples of the leaves infested with the Aleurodes of the Tobacco plant. These present a whitish-speckled appearance from the abundance of the small insects covering them. In this last letter he writes that the insect has caused a good deal of damage to the tobacco plantations of the valley of Trichonia. It has been observed that after continued rains it disappears, probably being washed away in numbers, as it is a very small and delicate insect. It thrives and multiplies rapidly, however, in dry weather. Plants growing in poor soil show its attacks earlier. The attacked leaves become nearly useless, acquiring a very bad taste.

A CORN ROOT-WORM IN SOUTH CAROLINA.

The larva of *Diabrotica* 12-*punctata* has been sent to us by Dr. J. W. Thomas, of Abbeville, S. C., with the statement that it was taken imbedded its full length, head up, in the heart of a stalk of corn at the base. He writes that this insect cost him at least 100 bushels of corn in the year 1857, and is this year damaging the stands of corn generally. In 1887 it was confined to the bottom lands, but now the uplands are attacked. Sandy bottoms are exempt. Corn planted before the 1st of April was not injured much, but all planted in April seriously damaged. It is likely also that corn planted even as late as June would not escape its ravages. A strong top dressing of lime would help to reduce its numbers, and to let the land lay in fallow through one summer, when it can be spared, will starve out the majority of them. The most practical idea that can be suggested for this insect is to spray all cucurbitaceous plants in the vicinity of corn-fields later on in the season with a dilute arsenical solution, with the view of destroying the perfect beetles, which would otherwise winter over and deposit their eggs about the corn roots the following spring.

A DEER BOT-FLY.

We have received, through the kindness of Mrs. A. E. Bush, of San José, Cal., specimens of the larva of a bot-fly infesting the deer. The larvæ sent were taken from a pocket under the jaw of a yearling deer from Humboldt County, Cal., and as nearly as can be determined belong to an undescribed species of the genus *Cephenomyia.* The

pockets in which these larvæ are found do not show from the outside, but are seen as soon as the hide is removed, generally just where the head and neck join under the jaw. In the animal referred to there were two pouches or pockets on one side, one lower than the other, an unusual case, as there is generally one on each side. The popular account given by old hunters is that the eggs are deposited by a fly which enters the head, probably by the nostrils. One deer's head examined had the pocket of larvæ between the ear and the upper jaw, with an opening into the tube at one side of the glottis, opening into the mouth near the roof. This is an insect of much interest, and we rely on our correspondent to secure further specimens alive and to endeavor to breed the fly.

THE SHIELD METHOD FOR LEAF-HOPPERS.

Mr. Eugene Weston, of Cañon City, Colo., secretary of the Fremont County Horticultural Society, writes us of the success of the following plan for combating the Grape-vine Leaf-hopper: Four lath nailed in a square and suitably braced are covered with drilling, which is then smeared over with the residuum of petroleum remaining after the kerosene is distilled off, which is easily obtained in quantity from the local oil-wells in that vicinity. One man carries the frame while another raises the vines, thereby disturbing the leaf-hoppers, which fly against the shield, and are thus destroyed by millions. The best time for the operation was found to be just before or near sundown and nightfall, as the temperature rapidly cools there at that time of the day. It should not be so warm that the hoppers fly, nor so cool that they fall at once to the ground. If the frame is held at a slight angle and as near as possible to the vines, they will hop on it in myriads. The operation must be rapidly and thoroughly performed, and repeated as often as the hoppers again become numerous.

This plan has also been used by grape-growers in California and New York, with considerable success, during 1887 and 1888.

LORD WALSINGHAM'S INDEX.

In our next number we shall resume the publication of Lord Walsingham's "Steps towards a Revision of Chambers's Index, with Notes and Descriptions of new Species." The next number will begin with the genus Lithocolletis. We regret that we have not been able to publish this valuable work in consecutive numbers of INSECT LIFE, but we have received the copy in installments, and the distance in time between Washington and England has rendered it impossible.

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

June 6, 1889.—Mr. Ashmead read a letter, which he had recently received from Mr. D. Redmond, of St. Nicholas, Fla., in confirmation of his (Ashmead's) statements regarding the leaf-eating habits of a Florida spider made at the meeting of the society in December last (INSECT LIFE, Vol. I, p. 200). Mr. Redmond wrote that the destruction of the trees, which occurred in the spring and early summer, was effected by the spiders eating all the thick portion of the leaf, as a silk-worm eats the mulberry, and also by gumming up and sticking the leaves together by means of some adhesive secretion. Dr. Marx held that while the spiders might cut off the leaves and web them together, a study of the mouth parts makes it questionable whether any spider is phytophagous, which opinion was also held by Mr. W. M. Wheeler. Mr. Howard thought that Tortricid larvæ, probably abundant but overlooked, had attracted the spiders.

Mr. Schwarz read and commented on portions of a letter by Henry Stanley to the Royal Geographical Society of England, referring to certain insects observed in Central Africa—a small gray caterpillar (*Lagoa?*) and a spider (*Theraphosidæ*)—and to poisoned arrows used by the natives, the poison of which is obtained by boiling the dried and powdered bodies of red ants in palm oil.

In a note on Brood VIII of the Periodical Cicada Mr. Schwarz recorded its appearance, May 19–21, this season in limited numbers at Harper's Ferry, District of Columbia, and in Alexandria County, Va. At Harper's Ferry all the Cicadas seen were on a clearing surrounded by woods, and Mr. Schwarz pointed out that under such conditions the development of the Cicadas is no doubt accelerated by the increased warmth of the soil within the clearings.

Mr. Schwarz also presented for publication a paper recording the food habits and food plants of a number of Coleoptera, chiefly *Rhynchophora*.

Dr. Marx read a paper on the morphology of *Filistata capitata* Hentz., in which he described a remarkable comb-like organ on the inner surface of the inferior spinnerets which has the function of an accessory *calamistrum*. He also made some observations on the value in classifications of the three or four stigmatal openings to the lungs, dividing the *Araneina* into *Tri-sticta* and *Tetra-sticta*. He had found a rudimentary fourth stigma in the species under consideration, showing that it had hitherto been wrongly placed in the first of the groups mentioned. The paper was accompanied by careful drawings illustrating the various points discussed.

C. L. MARLATT,
Acting Recording Secretary.